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FERNBANK ZENS
5331 Fernbank Road
Site Servicing Report

Prepared for: Claridge Homes

Engineering excellence. Planning progress. Liveable landscapes.

FERNBANK ZENS
5331 Fernbank Road

OTTAWA, ONTARIO

Site Servicing Report

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Submitted: June 2, 2021
Revised: November 5, 2021

Novatech File: 121-011
Ref: R-2021-079

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November 5, 2021

City of Ottawa
Planning and Infrastructure Approvals
110 Laurier Street West, 4th Floor
Ottawa, ON, K1P 1J1

Attention: **Santhosh Kuruvilla**

Reference: **Fernbank Zens - 5331 Fernbank Road**
Site Servicing Report
Our File No.: 121011

Please find enclosed for your review the revised Site Servicing Report including the hydraulic network analysis and stormwater management for the Fernbank Zens at 5331 Fernbank Road. The site is bounded by Cope Drive to the north, the existing SOHO development to the east, Fernbank Road to the south and Terry Fox Drive to the west.

This report addresses the approach to site servicing (sanitary/storm/watermain) and to stormwater management for the subject property. Also, the hydraulic analysis portion examines the proposed water distribution system as it relates to the existing infrastructure and future watermain distribution. This report demonstrates that the site servicing and stormwater management can be achieved and that the proposed water distribution system can provide adequate system pressures for the maximum day plus fire and the peak hour design conditions at all nodes throughout the development.

This report is submitted in support of the engineering detailed design for the Claridge Homes site plan application.

Trusting this report is adequate for your purposes. Should you have any questions, or require additional information pertaining to the enclosed report, please contact us.

Yours truly,

NOVATECH

Drew Blair, P. Eng.
Project Manager

Cc Vincent Denomme, Claridge Homes

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121011-GR2 – Grading Plan

121011-SAN – Sanitary Drainage Areas Plan

121011-STM – Storm Drainage Areas Plan

1.0 INTRODUCTION

This Site Servicing Report was prepared as part of the engineering detailed design for the Fernbank Zens residential development at 5331 Fernbank Road.

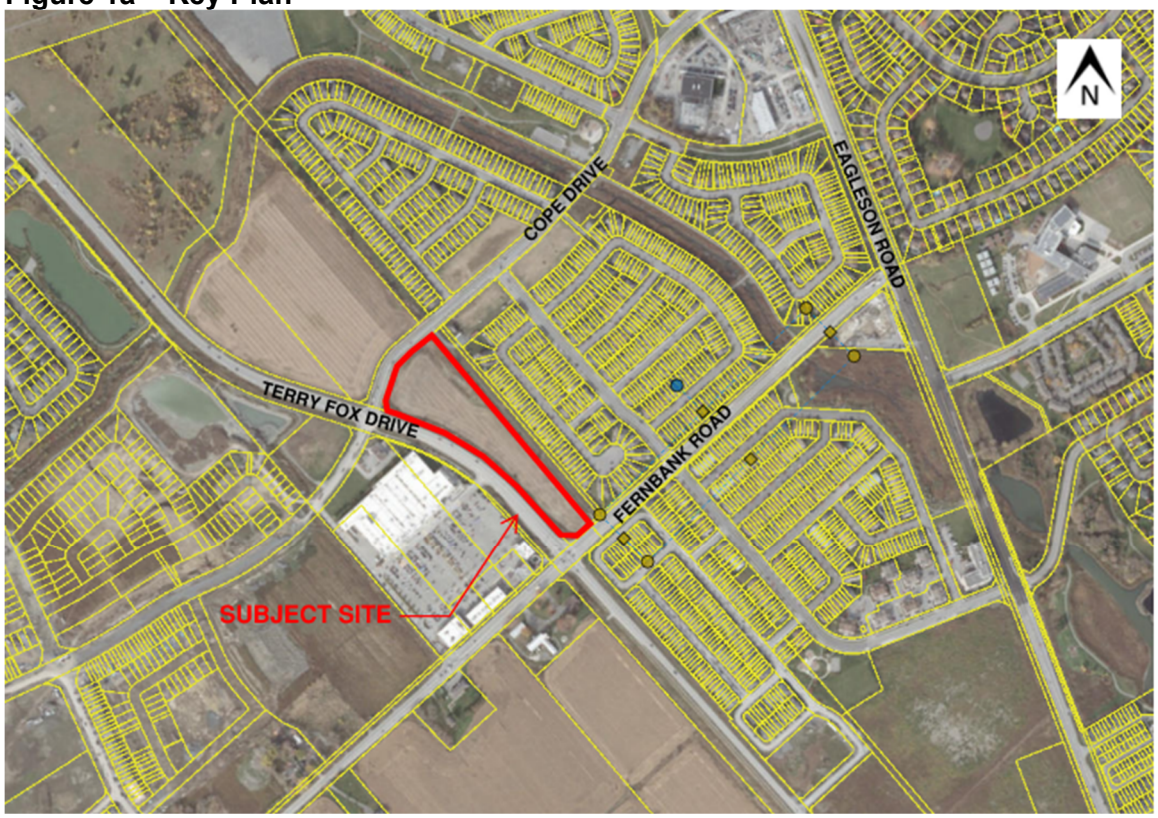
1.1 The Site

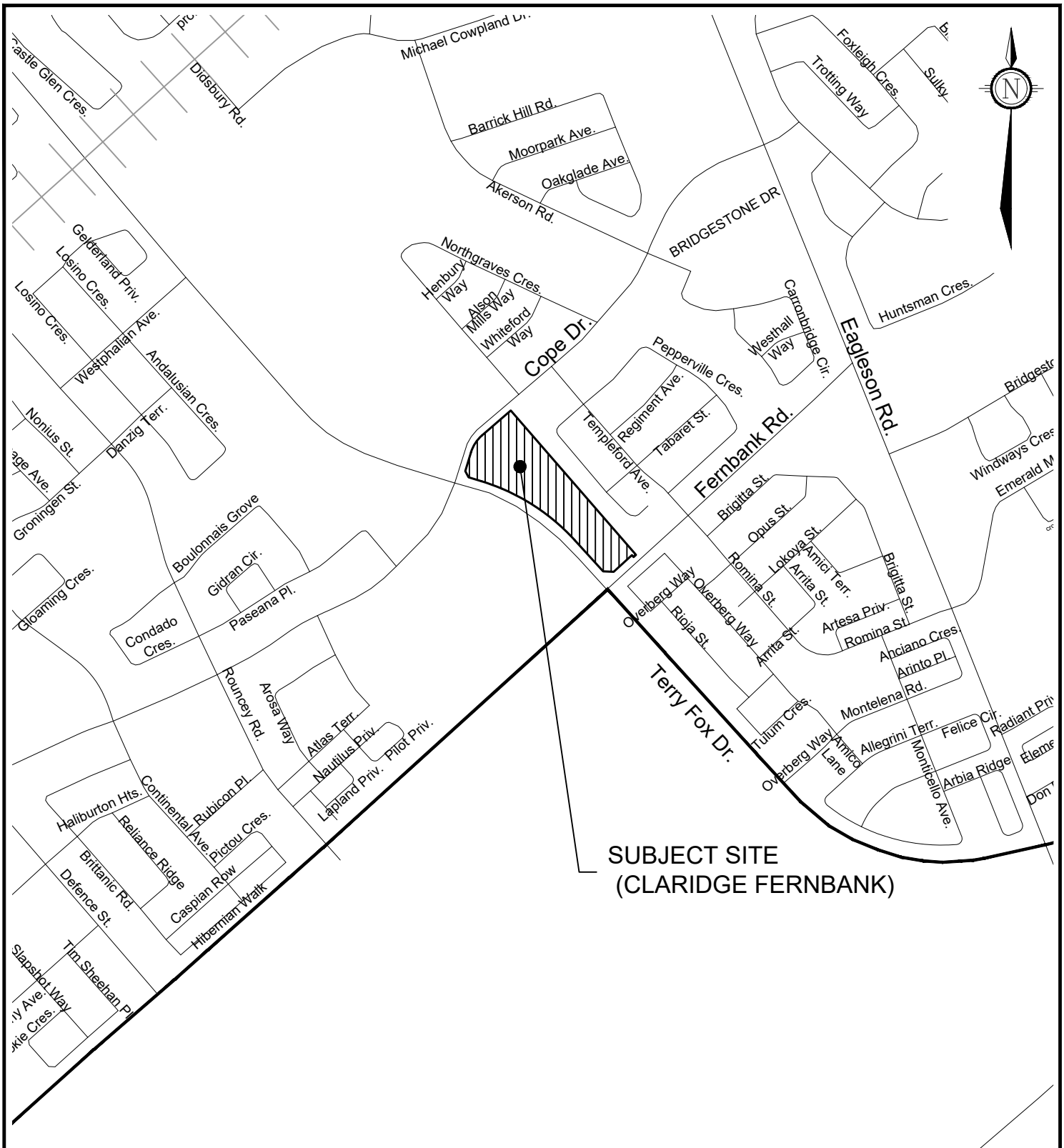
The proposed Fernbank Zens site (**approximately 3.68** ha) is owned by Claridge Homes and located within the City of Ottawa. The site is bounded by Cope Drive to the north, the existing SOHO development to the east, Fernbank Road to the south and Terry Fox Drive to the west as shown on Figure 1a/1b – Key Plan.

The legal description of the property is designated as Part of Lot 30 Concession 10, Goulbourn, Part 1 Plan 4R17373 , Except Part 4, Plan 4R20112; Ottawa. Subject to an Easement in Favour of Hydro Ottawa Limited Over Parts 5,6, 7, 8 and 9 Plan 4R20112 as in OC455206. Road Allowance Between Lots 30 and 31 Concession 10, Goulbourn Lying Between Parts 3 and 4 on 4R17373 and Part 2 on Plan 4R20112, as Closed by N599928; Ottawa. Part of Lot 31, Concession 10, Goulbourn, Part 1 on Plan 4R19334 City of Ottawa.

The Fernbank Zens site is proposed to be developed as a residential site plan which will consist of approximately 192 Zen type dwelling units within 16 low-rise buildings and on-site parking with access from Cope Drive and Terry Fox Drive as shown on Figure 2 – Site Plan. The existing lands are presently vacant but were previously occupied by farmland as shown on **Figure 3** – Existing Conditions.

Figure 1a – Key Plan





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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

KEY PLAN

SCALE N.T.S.

DATE	JOB	FIGURE
JUNE 2021	121011	FIG-1B

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EXISTING RESIDENTIAL LANDS

FERNBANK ZENS SITE

FERNBANK ROAD

TERRY FOX DRIVE

COPE DRIVE

Concrete Sidewalk

BLDG A
BLDG B
BLDG C
BLDG D
BLDG E
BLDG F
BLDG G
BLDG H
BLDG J
BLDG K
BLDG L
BLDG M
BLDG N
BLDG P
BLDG Q
BLDG R

600mmØCSP
T/P=96.43
INV=95.96

600mmØCSP
T/P=96.43
INV=95.83

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SITE PLAN

SCALE 1 : 1000 (0 10 20 30 40)

DATE	JOB	FIGURE
NOV 2021	121011	FIG-2

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TEMPLEFORD AVENUE

COPE DRIVE

PATRIOT PLACE

FERNBANK ROAD

CLARIDGE
FERNBANK SITE

TERRY FOX DRIVE

N

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CITY OF OTTAWA
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FERNBANK ZENS

EXISTING CONDITIONS

SCALE N.T.S.

DATE OCT 2021 | JOB 121011 | FIGURE FIG-3

SHT11X17.DWG - 279mmX432mm

1.2 Planning Context

The subject property is designated General Urban Area in the City of Ottawa Official Plan. General Urban Areas are generally areas of commercial. Industrial or medium and high-density residential housing. The proposed development conforms to these policies of the Official Plan.

The Subject Site is currently zoned *General Mixed Use – GM* and subject to Urban Exception number 2411 under the *City of Ottawa's Zoning By-law 2008-250*The purpose of the *General Mixed Use – GM* is to:

1. *allow residential, commercial and institutional uses, or mixed-use development in the **General Urban Area** and in the Upper Town, Lowertown and Sandy Hill West Character Areas of the Central Area designations of the Official Plan;*
2. *limit commercial uses to individual occupancies or in groupings in well-defined areas such that they do not affect the development of the designated Traditional and Arterial Mainstreets as viable mixed-use areas;*
3. *permit uses that are often large and serve or draw from broader areas than the surrounding community and which may generate traffic, noise or other impacts provided the anticipated impacts are adequately mitigated or otherwise addressed; and*
4. *impose development standards that will ensure that the uses are compatible and complement surrounding land uses*.

The proposed development of a low density apartment building is a permitted land use within the *General Mixed Use – GM* zone. The building has been designed to be compliant with the standards of the *General Mixed-Use Zone,* and the residential nature of the building is compatible with the surrounding properties.

1.3 Referenced Guidelines

This report has been prepared in accordance with the City of Ottawa Servicing Study Guidelines for Development Applications, the Water Distribution Design Guidelines (July 2010), the Ottawa Sewer Design Guidelines (October 2012) and the three (3) subsequent Technical Bulletins (ISTB-2018-01, ISTB-2018-02 and ISTB-2018-03).

1.4 Additional Reports

This Servicing Design Brief provides information on the considerations and approach by which Novatech Engineering Consultants Ltd. (NECL) has designed and evaluated the proposed servicing system for the Fernbank Zens lands. This report should be read in conjunction with the following:

1) *Geotechnical Investigation – Proposed Residential Development, 5331 Fernbank Road, Ottawa, Ontario,* Paterson Group Inc., March 5, 2021. Report No. PG5683-1

2) *Serviceability Report – Cavanaugh Construction Ltd. / Karam SOHO West – Rev 3, Stantec Consulting Ltd., October 31, 2007*

3) *Cavanaugh Construction – Soho West (Phase 1 and 2), Kanata South, City of Ottawa Stormwater Management Report, Stantec Consulting Ltd. October 31, 2007*

4) *Monahan Drain Constructed Wetlands – Updated Hydrologic and Hydraulic Analysis, City of Ottawa, J.F. Sabourin and Associates Inc (JFSA), March, 2019*

5) *Servicing and Stormwater Management Brief - Van Gaal Lands 5331 Fernbank Road and 1039 Terry Fox Drive, Novatech Engineers, Planners & Landscape Architects, September 1, 2015*

6) *Van Gaal Lands Claridge Developments — 1039 Terry Fox Drive and 5331 Fernbank Road – Site Serviceability and Stormwater Management Report, Novatech, May 2021*

1.5 Consultations and Approvals

The Subject Site is located upstream of the approved Phase 1 of the Trailwest (formerly SOHO West) Subdivision. The SOHO West Serviceability Report, *SOHO West- Rev. 3, Serviceability Report, Prepared by Stantec, dated October 31st, 2007,* calculated sanitary and stormwater flows to outlet to Cope Drive from the land that makes up 5331 Fernbank Road.

The Ministry of the Environment (MOE) and the Rideau Valley Conservation Authority (RVCA) will be consulted regarding the proposed development.

2.0 PRE-DEVELOPMENT CONDITIONS

2.1 The Site

The Fernbank Zens site is approximately 3.68 hectares and is currently undeveloped and is mainly former agricultural lands that are currently fallow. There is access to the site via Cope Drive to the north and Terry Fox Drive to the west. The Existing Conditions Plan is provided as Figure 3.

2.2 Existing Drainage

Under existing conditions, the site grading is relatively flat with sheet drainage to an existing ditch to the west along Terry Fox Drive and an existing ditch along the old Hazeldean Side Road on the east side of the parcel. These ditches eventually convey flows to the Monahan Municipal Drain to the north and east of the site.

2.3 Geotechnical Investigation

Paterson Group conducted a geotechnical review in support of the proposed residential development on the Claridge Homes Lands. The findings of this investigation are documented in their report titled *Geotechnical Investigation – Proposed Residential Development, 5331 Fernbank Road* **[2]**.

The field program for the current geotechnical investigation was carried out in February 2021. It consisted of advancing five (5) boreholes to a maximum depth of 6.7m below ground surface. Previous field investigations were completed by Paterson for the subject site in January 2018 and May 2006. A total of 9 boreholes were advanced to a maximum depth of 14.6 m during the previous investigations. The principal findings are summarized as follows:

- A surficial layer of topsoil of thickness from 0.19m to 0.36m for all boreholes except boreholes BH1-18, BH7-18 and BH8-18. These boreholes had a layer of fill of thickness 0.53m, 0.48m and 0.33m respectively consisting of crushed stone with silt and sand.
- An interbedded brown silty sand with stiff brown clayey silt to silty clay of thickness 1.2m to 3.7m was encountered below the topsoil.
- The brown silty sand with stiff brown clayey silt to silty clay layer is underlain with a deep deposit of firm grey silty clay with some sand of thickness 3.8m to 11.9m.

- Based on geological mapping, the bedrock in this area is part of the Gull River formation, which consists of interbedded limestone and dolomite with an overburden drift thickness ranging between 25 to 50 m.
- Groundwater inflow was observed in test pits. Based on these observations, the long-term groundwater level is expected between 1.5 to 2.5 m depth.
- Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. Grain size distribution and hydrometer testing was also completed on selected soil samples.
- Based on the results of the Atterberg limit testing mentioned above, the plasticity index was found to be less than 40% in all the tested clay samples. In addition, based on the clay content found in the clay samples from the grain size distribution test results, moisture levels and consistency, the silty clay across the subject site is considered low to medium sensitivity clay and should not be designated as sensitive marine clays.
- The permissible grade raise recommendation for finished grading within 6 m of a building footprint is 1.5 m and the permissible grade raise restriction for finished grading along access lanes and parking lots is 2.0 m.
- Expanded Polystyrene (EPS) geofoam may be used for this site within the porches and garages if the proposed grade raise is greater than allowed.

The report provides engineering guidelines based on Paterson Group's interpretation of the borehole information and project requirements. Refer to the final Geotechnical Report dated March 5, 2021 by Paterson Group for complete details.

3.0 STORMWATER MANAGEMENT

The post-development storm sewer and stormwater management system has been designed in accordance with the Ottawa Sewer Design Guidelines and will adhere to previously established release rates for this area.

3.1 Previous Studies (Trailwest Subdivision / Monahan Drain Cell 1)

The subject lands are tributary to the existing storm sewer on Cope Drive, which was designed by Stantec (2007) as part of Phase 1 of the Trailwest (formerly SOHO West) Subdivision. The Fernbank Zens Lands were included in the overall storm drainage design and is represented as subcatchment FUT-13B. Refer to Drawing OSD – Overall Storm Drainage Area Plan, SOHO – Kanata South (Rev. 7), Stantec (February 25, 2009), provided in **Appendix A**.

3.2 Stormwater Management Criteria

SOHO (Trailwest) Subdivision (Stantec, 2007)

As part of the overall storm drainage design for the SOHO Subdivision, storm runoff from the Zens Lands (catchment FUT13-B) was allocated to MH1013 on Cope Drive based on the following parameters:

Drainage Area Parameters

- Area ID = FUT-13B
- Drainage Area = 3.73 ha
- Runoff Coefficient = 0.65

The stormwater management model for the SOHO subdivision assigned the following stormwater management criteria to catchment FUT-13B:

- Minor system inlet rate = 317.1 L/s (85 L/s/ha x 3.73 ha)
- Major system storage = 60 m^3/ha
- 100-year Major system peak flow = 781 L/s

J.F Sabourin and Associates completed an updated hydrologic and hydraulic assessment of the Monahan Drain SWM Facility which provided an updated 100-year boundary condition of 95.05m at MH1013 in Cope Drive. Excerpts from these reports are provided in **Appendix A**.

3.3 Existing and Proposed Storm Infrastructure

The proposed development will be serviced by approximately 1,175m of storm sewers ranging from 250mm to 825mm in diameter. The minor system outlet is an existing 1200mm x 1800mm concrete box storm sewer at MH1013 on Cope Drive, which runs through the Trailwest Subdivision and conveys runoff to a Vortechnics hydrodynamic separator for water quality treatment before discharging to Cell 1 of the Monahan Drain. The proposed storm layout can be seen on **Figure 4** – Storm Alignment.

3.3.1 Minor System (Storm Sewers)

Storm servicing for the proposed development will be provided using a dual-drainage system. Runoff from frequent events will be conveyed by the proposed storm sewers (minor system), while flows from large storm events that exceed the capacity of the minor system will be stored on the surface in road sags and/or conveyed overland along defined overland flow routes (major system).

Storm Sewer Design Criteria

The following is the storm sewer design criteria [Ottawa Sewer Design Guidelines (Oct. 2012)]:

- Rational Method (Q) = 2.78CIA, where
  - Q = peak flow (L/s)
  - C = runoff coefficient
    - C = (0.70 * %Imp.) + 0.20
  - I = rainfall intensity for a 2-year return period (mm/hr)
    - $I_{2yr} = 732.951 / [(Tc(min) + 6.199)]^{0.810}$
  - A = site area (ha)
- Minimum Pipe Size = 250 mm; Minimum / Maximum Full Flow Velocity = 0.8 m/s / 3.0 m/s

The on-site storm sewers will be sized to convey the peak flows corresponding to a 2-year return period storm event. Refer to the storm sewer design sheets provided in **Appendix A**.

Inlet Control Devices

Inlet control devices (ICDs) will be used to restrict inflows to the minor system. ICDs will be sized to control minor system peak flows to the Cope Drive storm sewer to the allowable release rate of 317.1 L/s.

The uncontrolled flows directed overland have been accounted for as part of the major system design.

PATRIOT PLACE

FERNBANK ROAD

COPE DRIVE

TERRY FOX DRIVE

CONNECT TO EXISTING STMMH
INV.=94.08

BLDG-A
BLDG-B
BLDG-C
BLDG-D
BLDG-E
BLDG-F
BLDG-G
BLDG-H
BLDG-J
BLDG-K
BLDG-L
BLDG-M
BLDG-N
BLDG-P
BLDG-Q
BLDG-R

LEGEND

- SITE BOUNDARY
- PROPOSED STORM SEWER C/W FLOW DIRECTION
- EXISTING STORM SEWER C/W FLOW DIRECTION

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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

STORM ALIGNMENT

1 : 1500 (0, 15, 30, 45, 60)

NOV 2021 | 121011 | FIG4-STM

SHT11X17 DWG - 279mm X 432mm

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Hydraulic Grade Line

The storm sewers will be designed to ensure the hydraulic grade line (HGL) elevation for a 100-year storm event will provide a minimum 0.30 m clearance from the underside of footing (USF) elevation.

3.3.2 Major System (Overland Flow)

Under post-development conditions, the majority of the site will be graded to provide an overland flow path to convey major system runoff towards Cope Drive. The uncontrolled areas have been graded to direct flows overland to either the adjacent Fernbank Road ROW or Terry Fox Drive ROW. Refer to the Grading Plans (Drawing 121011-GR1 and GR2).

Major System (Overland Flow) Criteria

Runoff from storms that exceed the minor system capacity are to be stored or conveyed overland within the right-of-way and/or defined drainage easements. The following overland flow criteria from the OSDG will be applied to the design:

- Ensure that major system flows have a maximum dynamic depth of 0.35 m (static ponding + dynamic flow) during the 100-year event.
- Ensure the product of velocity x depth does not exceed 0.60 during the 100-year event.

The major system will be evaluated using a hydraulic model to ensure that the maximum total flow depth (static + dynamic) will be restricted to 0.35 m during the 100-year storm event; and water levels will not touch the building envelope / lowest opening during the Stress Test event (100-year +20%).

3.4 Proposed Stormwater Management Strategy

Stormwater Quality Control

The existing Vortechs unit immediately upstream the outlet to Cell 1 of the Monahan Drain Constructed Wetlands has been designed to provide an Enhanced level of water quality control for the contributing drainage area, including Fernbank Zens Lands. The proposed site layout has a slightly smaller drainage area and the same coefficient than was used to size the Vortechs unit, and as such will provide the required level of water quality treatment – refer to **Table 3.1**.

Table 3.1: Vortechs Sizing Criteria (Fernbank Zens)

Design	Catchment ID	Parameters	Description
Stantec (2007)	**FUT-13B**	**3.73 ha, C = 0.65**	**Area to Cope Drive / Vortechs Unit**
Novatech (2021)	**A1-A27**	**3.55 ha, C = 0.67**	**Area to Cope Drive / Vortechs Unit**
	U1, U5	**0.15 ha, C = 0.27**	**Uncontrolled Areas**
	TOTAL	**3.70 ha, C = 0.65**	**Total Drainage Area (Controlled + Uncontrolled)**

Stormwater Quantity Control
Surface/Underground storage will be provided within the road sags/parking areas/oversized underground storage pipes, based on the minimum major system storage requirement of 60 m^3/ha taken from the downstream Trailwest (SOHO West) approved design by Stantec.

The Cope Drive storm sewer and Cell 1 of the Monahan Drain Constructed Wetlands have been designed to accommodate post-development runoff from the site based on a contributing drainage area of 3.73 ha and a runoff coefficient of C = 0.65. The proposed development has a total drainage area of 3.70 ha and a runoff coefficient of C = 0.65. Therefore, there will be no increase in runoff volume to the Monahan Drain from the 2007 Stantec design and the 2019 J.F Sabourin review.

3.4.1 Stormwater Management Model Development

The PCSWMM model has been developed to account for both minor and major system flows from the development and ensure no adverse impacts on the downstream watercourses and wetland areas. The result of the analysis were used to:

- Determine the total major and minor system runoff from the site;
- Size the ICDs for each inlet to the storm sewer system;
- Calculate the storm sewer hydraulic gradeline for the 100-year storm event;
- Evaluate overland flow depths and ponding volumes during the 100-year event; and
- Ensure no ponding occurs during the 2-year storm event.

3.4.2 PCSWMM Model Parameters

Design Storms
The model includes the following design storms based on the City of Ottawa IDF data presented in the City of Ottawa Sewer Design Guidelines (October 2012). The 24-hour SCS storm distribution was provided by JFSA and was used for the analysis of the Monahan Drain.

- 3-hour Chicago Storm Distribution (10-minute time step)
- 24-hour SCS Storm Distribution from JFSA (12-minute time step)

The 3-hour Chicago storm distribution includes the 2-year, 5-year, 100-year, and 100-year (+20%) return periods while the 24-hour SCS storm distribution includes only the 100-year return period.

PCSWMM Model Schematics, Output Data and Modeling Files
PCSWMM model schematics and output data for the 100-year 3-hour Chicago and 100-year 24-hour SCS (JFSA) storm distributions are provided in **Appendix A**. The PCSWMM modeling files are provided electronically as part of the submission package.

Subcatchment Areas / Runoff Coefficients

- For modeling purposes, the site has been divided into subcatchments based on the drainage areas tributary to each inlet of the proposed storm sewer system. The catchment areas are shown on the Storm Drainage Area Plans (**121011-STM**). Refer to the Grading Plans (**121011-GR1 and GR2**) and the General Plan of Services (**121011-GP1 and GP2**) for the location of high points and low points, and the storm sewer layout, respectively.
- The weighted runoff coefficients and percent impervious values are provided in **Appendix A**. As per the City of Ottawa Sewer Design Guidelines (October 2012), the percent impervious values are based on the following equation:

  % Imp. = (C – 0.20) / 0.7

The hydrologic parameters for each subcatchment were developed based on the Grading Plans and the Storm Drainage Area Plans. An overview of the drainage area parameters is provided in **Table 3.2.**

Table 3.2: Hydrologic Model Parameters

Area ID	Catchment Area (ha)	Runoff Coeff. (C)	Percent Imperv. (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
Controlled Areas							
A01	0.04	0.52	45.7	70	20	20	1.5
A02	0.04	0.72	74.3	70	15	27	1.5
A03	0.08	0.56	51.4	70	20	40	1.5
A04	0.21	0.80	85.7	15	25	84	1.5
A05	0.09	0.78	82.9	20	25	36	1.5
A06	0.12	0.83	90.0	20	20	60	1.5
A07	0.18	0.52	45.7	5	35	51	1.5
A08	0.07	0.49	41.4	70	20	35	1.5
A09	0.13	0.81	87.1	20	20	65	1.5
A10	0.19	0.57	52.9	80	25	76	1.5
A11	0.12	0.81	87.1	40	20	60	1.5
A12	0.32	0.76	80.0	40	40	80	1.5
A13	0.12	0.71	72.9	40	20	60	1.5
A14	0.15	0.58	54.3	80	25	60	1.5
A15	0.12	0.81	87.1	45	20	60	1.5
A16	0.08	0.72	74.3	15	15	53	1.5
A17	0.12	0.37	24.3	85	35	34	1.5
A18	0.13	0.77	81.4	20	30	43	1.5
A19	0.14	0.80	85.7	15	35	40	1.5
A20	0.17	0.57	52.9	80	25	68	1.5
A21	0.25	0.80	85.7	30	25	100	1.5
A22	0.05	0.50	42.9	80	15	33	1.5
A23	0.14	0.74	77.1	50	20	70	1.5
A24	0.15	0.69	70.0	30	20	75	1.5
A25	0.09	0.39	27.1	85	20	45	1.5
A26	0.18	0.74	77.1	15	25	72	1.5
A27	0.07	0.70	71.4	60	20	35	1.5
TOTAL	**3.55**	**0.67**	**67.1**				
Uncontrolled Areas							
U01	0.02	0.41	30.0	90	5	40	1.5
U02	0.04	0.20	0.0	0	5	80	33.33
U03	0.06	0.20	0.0	0	5	120	33.33
U04	0.01	0.79	84.3	80	15	7	1.5
U05	0.02	0.26	8.6	0	5	40	1.5
TOTAL	**0.15**	**0.27**	**10**				

Depression Storage

- The default values for depression storage (1.57mm impervious / 4.67 mm pervious) have been applied to all catchments.
- The 'zero impervious' parameter (areas with no depression storage) for all catchments is based off the percent of roof top areas to total impervious area.

Subarea Routing

- Subarea routing for all catchments draining to Cope Drive is 'pervious to impervious'.

Minor System Conduits (Bend / Exit Losses)

- The minor system network was created in Civil3D and imported into PCSWMM.
- The following exit losses have been inputted into the model. They represent the loss coefficient based on the bend angle, as per the Appendix 6-B in the City of Ottawa Sewer Design Guidelines (October 2012).

Bend Angle	Loss Coefficient
0	0.00
15	0.09
30	0.21
45	0.39
60	0.64
75	0.96
90	1.32

Downstream Boundary Condition (Minor System)

- The storm sewer outlet for the Fernbank Zens Lands is the existing maintenance hole (MH1013) on Cope Drive.
- The boundary condition for the storm outlet was set at the 100-year HGL elevation of the outgoing sewer (95.05m). This is based on the Sensitivity Analysis completed by JFSA. It represents an ultimate buildout condition of the vacant lands within the watershed. The boundary condition correspondence has been provided in **Appendix A**.

3.5 Minor System

Runoff from the site will be captured by the proposed on-site storm sewer network and attenuated by ICDs. Storage will be provided within a combination of underground storage (i.e. pipes / structures) and surface storage.

Inflows to the storm sewer were modeled based on the characteristics of each inlet. All the catchbasins in the roadways and parking areas are located at low points except for CB01 which is on-grade. Inflows to the storm sewer are based on the ICD specified for the inlet and the maximum depth of ponding. ICDs have been sized to limit the outlet peak flows to the allowable release rate of 317.1 L/s. Details are outlined as follows in **Table 3.3**. ICD information is indicated on the General Plan of Services (drawing 121011-GP1 and GP2).

Table 3.3: Inlet Control Devices and Design Flows

Structure ID	ICD Size & Inlet Rate						
	ICD Type	T/G (m)	Orifice Invert (m)	100-year Head on Orifice (m)	2-year Orifice Peak Flow* (L/s)	5-year Orifice Peak Flow* (L/s)	100-year Orifice Peak Flow* (L/s)
CBMH01	83mm	96.85	94.86	2.18	19.9	20.7	20.2
CBMH02	105mm	96.70	94.64	2.35	29.6	33.9	32.2
CBMH03	80mm	96.85	94.83	2.33	17.0	19.6	19.4
CBMH04	Tempest LMF Vortex 101	97.15	94.98	2.47	13.1	13.9	14.0
CBMH05	80mm	97.30	95.23	2.24	19.4	19.7	20.1
CBMH06	108mm	97.35	95.34	2.24	23.7	32.1	36.2
CBMH07	114mm	96.95	94.92	2.27	38.8	39.5	39.4
CBMH08	Tempest LMF Vortex 92	96.85	94.95	2.21	10.2	10.9	10.9
CBMH09	83mm	96.80	94.83	2.2	17.8	20.7	20.2
CBMH10	87mm	96.85	95.02	2.14	17.2	21.9	22.7
CBMH11	80mm	96.80	95.21	1.82	16.9	17.5	18.1
CBMH12	Tempest LMF Vortex 73	96.83	94.81	2.29	6.6	7.0	6.9
CBMH13	Tempest LMF Vortex 75	96.83	94.82	2.28	7.2	7.7	7.4
CBMH14	Tempest LMF Vortex 70	97.25	95.18	2.37	6.1	6.4	6.6
CBMH15	73mm	97.30	95.6	1.88	14.5	14.9	15.3
CBMH16	104mm	97.45	95.5	1.70	9.9	15.0	28.4
CB01	83mm	96.88	95.27	1.63	1.1	2.2	9.1

**PCSWMM model results for a 3-hour Chicago storm distribution.*

3.5.1 Hydraulic Grade Line (PCSWMM)

The Hydraulic Grade Line (HGL) within the storm sewer system was evaluated using the fixed HGL of 95.05 at MH 1013 on Cope Drive. This HGL elevation surcharges the storm sewer on Cope Drive by 0.24m (obvert elevation = 94.81m).

The results of the analysis were used to ensure that a minimum freeboard of 0.30m is provided between the 100-year hydraulic gradeline (HGL) and the designed underside of footing (USF) elevations. The HGL analysis confirms that all Buildings will have at least 0.30m of freeboard between the modeled hydraulic gradeline and the nearest USF. The HGL elevations for a 20% increase (rainfall intensity and total precipitation) in the 100-year storm even were also reviewed to ensure the HGL is below the USF.

Table 3.4 provides a summary of the 100-year HGL elevation at each storm manhole within the proposed development. The 100-year+20% HGL elevations have been provided in **Appendix A**.

Table 3.4: 100-Year Hydraulic Gradeline Elevations

Manhole ID	MH Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr-3hr (m)	Design USF (m)	Clearance (m)
MH200	95.50	96.60	95.40	96.05	0.65
MH202	95.38	96.57	95.29	96.00	0.71
MH204	95.22	96.42	95.20	95.90	0.70
MH206	95.13	96.26	95.17	95.75	0.58
MH208	95.07	96.03	95.14	95.65	0.51
MH210	95.01	96.09	95.12	95.60	0.48
MH212	94.97	95.94	95.10	95.45	0.35
MH214	94.93	95.91	95.08	95.38	0.30
MH218	95.58	96.54	95.48	96.15	0.67
MH220	95.09	96.16	95.14	-	-
MH222	95.11	96.12	95.13	95.65	0.52
MH224	95.06	95.97	95.12	-	-
MH230	95.18	96.03	95.16	-	-

3.5.2 Major System

The major system network was evaluated using the PCSWMM model to ensure that the overland flow depths and velocities conform to City standards. A summary of ponding depths at each inlet for the 2-year, 5-year, 100-year and 100-year (+20%) events are provided in **Appendix A**. The maximum static and dynamic ponding depths within the roadways are less than 0.35m during all events and the product of depth x velocity will be less than 0.60.

The underground and surface storage provided upstream of each ICD are represented in the model using a combination of storage curves and oversized storm sewers (**Appendix A**), which use a depth vs area relationship to represent the corresponding storage volumes at a given elevation. The underground parking area sewer pipes have been oversized in some areas to provide the required storage. They are installed at minimum slope however are accessible at either end for cleaning and maintenance purposes.

Table 3.5 provides a summary of the maximum static and 100-year ponding elevation at each catchbasin manhole within the proposed development.

Table 3.5: Overland Flow Results (100-year Event)

Structure	T/G (m)	Max. Static Ponding (Spill Depth)		100-yr Event (3hr)			
		Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)
CBMH01	96.85	97.15	0.30	97.04	0.19	N	0.00
CBMH02	96.70	97.00	0.30	96.99	0.29	N	0.00
CBMH03	96.85	97.15	0.30	97.16	0.31	Y	0.01

Structure	T/G	Max. Static Ponding (Spill Depth)		100-yr Event (3hr)			
		Elev.	Depth	Elev.	Depth	Cascading	Cascade Depth (m)
	(m)	(m)	(m)	(m)	(m)	Flow?	
CBMH04	97.15	97.45	0.30	97.45	0.30	N	0.00
CBMH05	97.30	97.60	0.30	97.47	0.17	N	0.00
CBMH06	97.35	97.65	0.30	97.58	0.23	N	0.00
CBMH07	96.95	97.25	0.30	97.19	0.24	N	0.00
CBMH08	96.85	97.15	0.30	97.16	0.31	Y	0.01
CBMH09	96.80	97.10	0.30	97.03	0.23	N	0.00
CBMH10	96.85	97.15	0.30	97.16	0.31	Y	0.01
CBMH11	96.80	97.10	0.30	97.03	0.23	N	0.00
CBMH12	96.83	97.13	0.30	97.10	0.27	N	0.00
CBMH13	96.83	97.13	0.30	97.10	0.27	N	0.00
CBMH14	97.25	97.55	0.30	97.55	0.30	N	0.00
CBMH15	97.30	97.60	0.30	97.48	0.18	N	0.00
CBMH16	97.45	97.50	0.05	97.20	0.00	N	0.00

The model results demonstrate that each storage area provides sufficient underground storage to ensure no surface ponding during the 2-year design event (the 2-year HGL elevation at each structure does not exceed the corresponding top of grate elevation.

An expanded table of the ponding depths at low points in the roadway and landscaped areas (including the stress-test event) is provided in **Appendix A**. Based on these results, the proposed storm drainage system will not experience any adverse flooding even with a 20% increase to the 100-year event.

3.5.3 Peak Flows (PCSWMM)

Table 3.6 provides a summary of the minor and major system flows from the Fernbank Zens Lands to Cope Drive, Fernbank Road ROW and Terry Fox Drive ROW for all storm events up to and including the 100-year.

Table 3.6: Summary of Peak Flows (PCSWMM)

Outfall	Allowable Release Rate	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow[(2)] (L/s)		Description
				3-hour Chicago	24-hour SCS	
Minor System	317.1 L/s	259.5	297.8	316.3	310.8	To Cope Drive MH1013
Major System	781 L/s	11.5	17.1	28.2	22.8	Flow to Cope Drive
		1.9	6.4	16.8	12.8	Flow to Fernbank ROW
		2.7	18.5	42.3	31.4	Flow to Terry Fox ROW
TOTAL	**1,098.1 L/s**	**275.6**	**339.8**	**403.6**	**377.8**	

[(2)] PCSWMM model results; fixed outfall at 95.05m (100-year HGL elevation at MH 1013 on Cope Drive).

The 100-year minor system peak flow to Cope Drive is controlled to just under the allowable release rate of 317.1 L/s for both the 3-hour Chicago and 24-hour SCS distributions.

The major system peak flows are significantly less than the allowable rate of 781 L/s. The PCSWMM model is based on the grading design, which provides significantly more than the required 60m^3/ha of major system storage.

4.0 SANITARY SEWER SYSTEM

4.1 Previous Studies

The Subject Site is located upstream of Phase 1 of the Trailwest (formerly SOHO West) Subdivision. The SOHO West Serviceability Report, *SOHO West- Rev. 3, Serviceability Report, Prepared by Stantec, dated October 31st, 2007,* calculated sanitary flows to outlet to Cope Drive from the lands that make up 1039 Terry Fox Drive and 5331 Fernbank Road, which includes the subject lands and lands north of the Monahan Drain and lands south of Cope Drive. Sanitary flows in this report were calculated to be 45.95L/s to outlet to the sanitary sewers on Cope Drive, which ultimately outlet to the Hazeldean Pump Station. Refer to **Appendix B** for excerpts.

In 2015, a rezoning application was submitted for the lands located at 5331 Fernbank Road & 1039 Terry Fox Drive. The land north of the Monahan Drain was rezoned from IP4 to IP to allow for the development of office buildings. The subject lands was rezoned from IP4 to R3X [2410]-h to allow for residential development. And lastly, the land south of Cope Drive to Fernbank Road was rezoned from IP4 to IP with exceptions to all for commercial development. The exceptions would allow for retail store and retail food store to be permitted as secondary uses. As part of the submission a servicing and stormwater report was included titled, *Van Gaal Lands: 5331 Fernbank Road and 1039 Terry Fox Drive, Ottawa, ON, Servicing & Stormwater Management Brief, completed by Novatech, Ref. No.: R-2015-123, dated September 1, 2015.* The 2015 report comprised of two separate outlets for the sanitary flow from 1039 Terry Fox Drive and 5331 Fernbank Road.

The subject lands and the lands south of Cope Drive outlet to the sanitary sewers on Cope Drive. A sanitary flow of 16.23L/s was calculated for the Cope Drive sanitary sewers.

The business park outlets to the existing 900mm sanitary sewer along Hazeldean Side Road due to its close proximity to the Hazeldean Pump Station. A sanitary flow of 25.81L/s was calculated to outlet to the Hazeldean Side Road sewer.

The total sanitary flows to the Hazeldean Pump Station was calculated to be 42.04L/s.

4.2 Existing Sanitary Sewer System for the Subject Lands

Currently, there is an existing 525mm sanitary trunk sewer along Cope Drive to the south and a 200mm sanitary sewer along Northgraves Crescent to the northeast. The sanitary trunk sewer along Cope Drive currently services the existing commercial plaza located at 5357 Fernbank Road and the existing Trailwest community. The Cope Drive trunk sewer ultimately outlets to the Hazeldean Pump Station via the sanitary pipe system in the Trailwest subdivision. Through pre-consultation with the City of Ottawa for the Van Gaal lands (north of Cope Drive), the underside of footing elevations (USFs) shall be a minimum of 95.30m, which is the emergency overflow elevation at the Pump Station. These conditions should apply to the subject site as both developments outlet to Cope Drive at the same location. Please see the **Appendix** for correspondence.

4.3 Proposed Sanitary Sewer Outlet

It is proposed that the site will outlet directly to the 525mm sanitary trunk sewer along Cope Drive. The proposed outlet is consistent with the approved SOHO West Serviceability Report (Stantec) and the approved Servicing & Stormwater Management Report (Novatech) as part of the rezoning application for the Van Gaal Lands. Refer to Section 1.3 for report details.

The proposed development can be serviced with a 200mm sanitary sewer system. The proposed sanitary layout can be seen on **Figure 5** – Sanitary Alignment.

4.4 Design Criteria

Sanitary sewers, for the proposed development, are designed based on criteria established by the City of Ottawa in the following documents:

- Section 4.0 of the City of Ottawa Sewer Design Guidelines (October 2012).
- Technical Bulletin ISTB-2018-01 from the City of Ottawa regarding new sanitary design parameters. Design parameters from this technical bulletin will supersede values within the Sewer Design Guidelines (2012).

The resulting design parameters are summarized as follows:

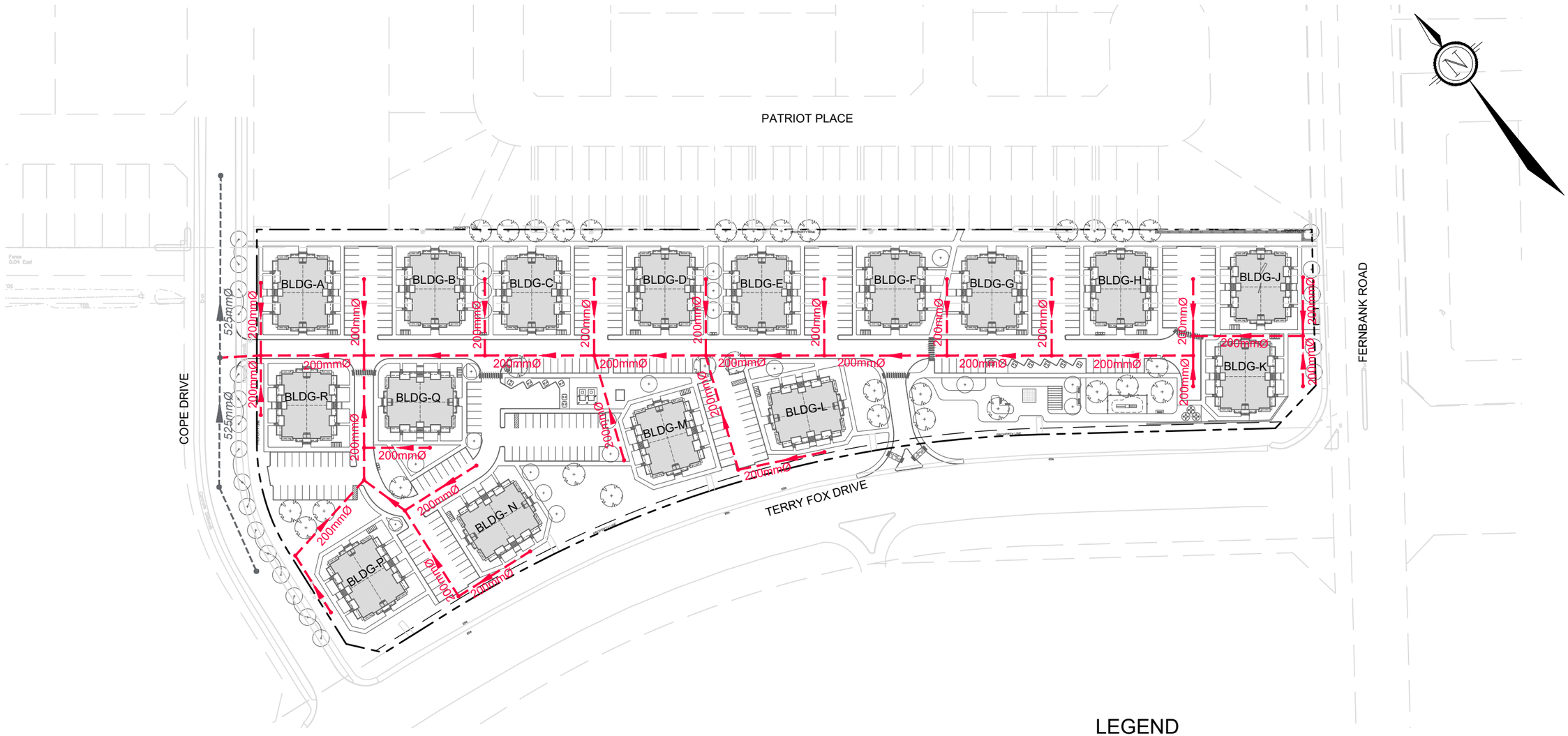
Population Flow = 280 L/capita/day
Infiltration = 0.33 L/s/ha
Apartment = 2.1 persons per unit
Maximum Residential Peak Factor = 4.0
Harmon Correction Factor = 0.8
Industrial/Commercial/Institutional Peak Factor
= 1.0, if area is <20% of total contributing area
= 1.5, if area is >20% of total contributing area
Industrial Peaking Factor: As per Appendix 4-B of the City of Ottawa Sewer Design Guidelines
Minimum velocity = 0.6m/s
Manning's n = 0.013

4.5 Proposed Sanitary Sewer System

The calculated peak sanitary design flow for the development is 5.68 L/s. For detailed calculations refer to the Sanitary Sewer Design Sheet located in **Appendix B** and **Figure 5** – Sanitary Alignment for sanitary drainage areas.

Sanitary flows from the subject lands were previously calculated in Stantec's Serviceability Report and the approved 2015 Servicing & Stormwater Management Report (Novatech) as part of the rezoning application for the Van Gaal Lands. As previously noted, sanitary flows from the lands north of the Monahan Drain will be directed to an existing 900mm diameter sanitary sewer on Hazeldean Side Road with the remaining two parcels outletting to the Cope Drive trunk sewer.

As a result, the proposed sanitary flows directed to the Cope Drive trunk sewer will be significantly less than previously calculated.



LEGEND

- SITE BOUNDARY
- PROPOSED SANITARY SEWER C/W FLOW DIRECTION
- EXISTING SANITARY SEWER C/W FLOW DIRECTION

NOVATECH
Engineers, Planners & Landscape Architects
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Website www.novatech-eng.com

CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

SANITARY ALIGNMENT

1 : 1500 (0, 15, 30, 45, 60)

NOV 2021 | 121011 | FIG5-SAN

SHT11X17.DWG - 279mmX432mm

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Outlet to Cope Drive Sewers

Proposed sanitary flows outletting to the Cope Drive trunk sewer versus the previously calculated sanitary flows from previous serviceability reports are listed in **Table 4.1**.

Table 4.1: Sanitary Flow Summary to Cope Drive

Development Condition	Population	Area (ha)	Peak Flow (L/s)	Peak Ext. Flow (L/s)	Peak Design Flow (L/s)
Claridge Residential Site North of Cope Dr. (Van Gaal Lands)	535	8.14	5.88	2.66	8.34
Subject Site		3.68	4.46	1.22	5.68
Total Flow (Proposed)					14.02
Stantec Serviceability Report	2811	23.14	39.47*	6.48	45.95
Novatech Approved Serviceability Report (rezoning)*		11.87	12.91	3.32	16.23

**Based on Table 4.1 of the rezoning report, Van Gaal Lands: 5331 Fernbank Road and 1039 Terry Fox Drive, Ottawa, ON, Servicing & Stormwater Management Brief, completed by Novatech, Ref. No.: R-2015-123,dated September 1, 2015.*

The total proposed sanitary flow from the subject site and the residential area north of Cope Drive (Van Gaal Lands) is 14.02 L/s, which represents a 69% decrease in sanitary flows compared to the calculated flows in the Stantec Serviceability Report (45.95 L/s) and a 13.0% decrease in sanitary flows compared to the calculated flows from Novatech's approved rezoning Servicing and Stormwater Management report (16.23L/s). This indicates there will be adequate capacity in the Cope Drive sewers to accommodate the proposed development.

For design sheet, drainage plans and design parameters from the Stantec Serviceability Report, refer to excerpts in **Appendix B**. For excerpts from Novatech's approved rezoning Servicing and Stormwater Management Report, refer to **Appendix B**.

5.0 WATER SUPPLY SYSTEM

5.1 Proposed Watermain System

As part of the detail design process, the City of Ottawa requires the developer to prepare a hydraulic network analysis of the proposed water distribution system within the Fernbank Zens site, confirming capacity in the water system as it relates to the existing infrastructure. The purpose of the hydraulic analysis is to confirm that the development can be adequately serviced from the existing 300mm diameter watermain on Cope Drive located in north of the Fernbank Zens site.

It is proposed to service the Fernbank Zens site with a 200mm watermain and localized 150mm mainline with two connections to the existing 300mm watermain on Cope Drive. The first connection will be made to the 300mm watermain on Cope Drive approximately 35m southwest of Northgraves Crescent. The second connection will be made to the 300mm watermain on Cope Drive approximately 75m southwest of Northgraves Crescent.

The site will be serviced internally with 38mm services to heated external cabinets at the corners of each building. Each 38mm waterline will service 3 dwelling units with 4 services (12 units) per building.

Figure 6 – Water Network Plan highlights the proposed works and connection points. All existing watermain boundary conditions were provided by the City of Ottawa and are included in **Appendix C**.

5.2 Design Criteria

The following design criteria (from the City of Ottawa and MOE Guidelines) were used to assess the proposed watermain sizes:

Residential (Based on MOE Design Guidelines for < 500 population)

Residential Demand:	280L per person per day
Apartments/Zen Units:	2.1 persons per unit
Maximum Daily Demand:	3.0 x Average Daily Demand
Peak Hour Demand:	4.5 x Average Daily Demand
Fire Flow Demand:	Fire Underwriters Survey
Fire Demand:	267.0 L/s Maximum for Fernbank Zens as per Fire Underwriter's Survey for Public Fire Protection.

System Pressures:

Maximum (System):	690 kPa (100 psi) as per City of Ottawa Guidelines
Maximum (Service):	550 kPa (80 psi) as per Ontario Plumbing Code
Minimum:	275 kPa (40 psi) except during fire flow condition
Minimum (fire):	140 kPa (20 psi)

Friction Factors:

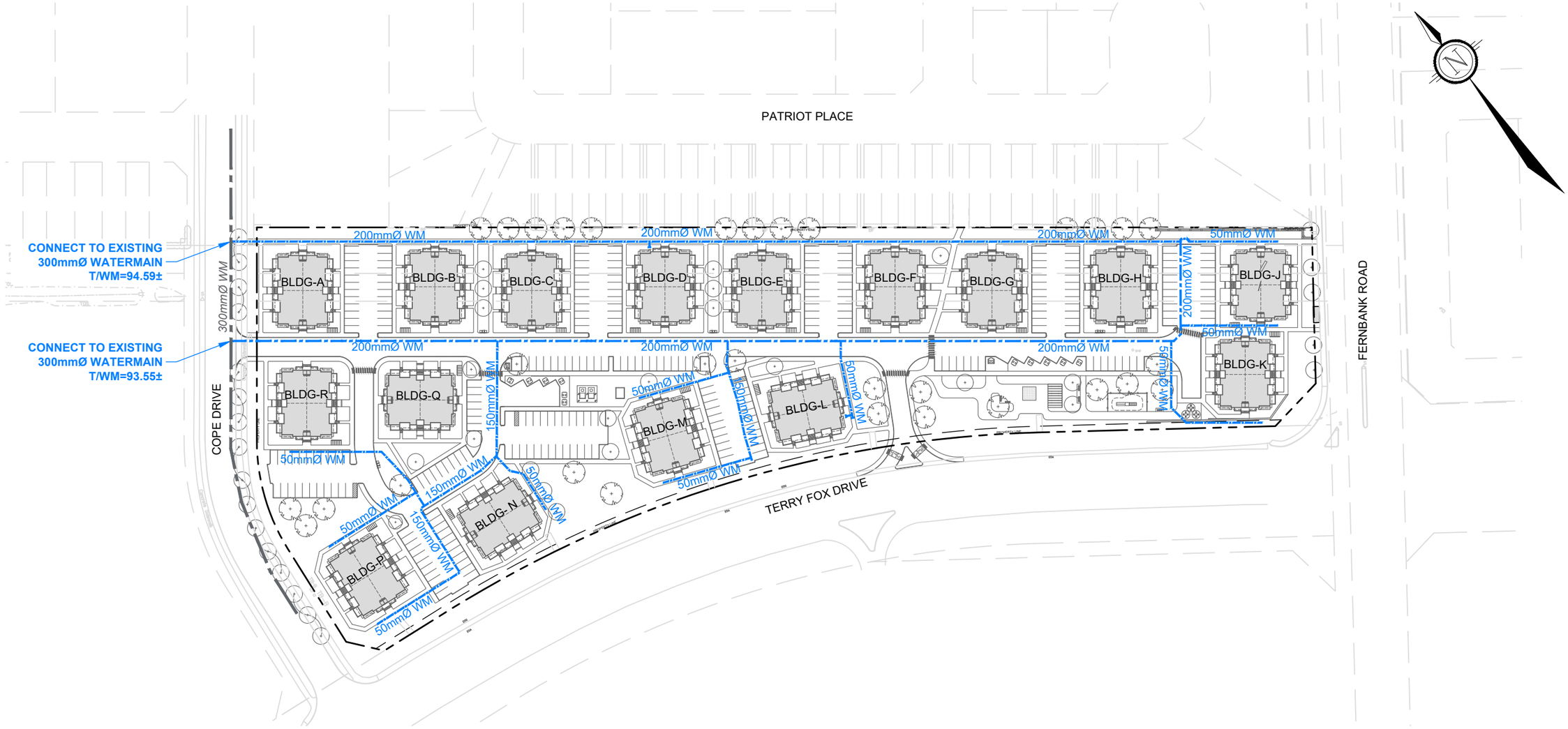
Size	C-Factor
Less than 200mm	100
200mm-300mm	110

Design Criteria for Water Demand:

Average Daily Demand; Maximum Daily Demand plus Fire Flow; and Peak Hour Demand.

5.3 Hydraulic Analysis

The hydraulic modelling program "EPANET for Windows Version 2.0" was used for the purpose of analyzing the performance of the proposed watermain network under the various operating conditions.



LEGEND

- SITE BOUNDARY
- PROPOSED WATERMAIN
- EXISTING WATERMAIN

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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

WATER NETWORK PLAN

1 : 1500 (0, 15, 30, 45, 60)

NOV 2021	121011	FIG6-WM

SHT11X17.DWG - 279mmX432mm

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The following table summarizes the demands under the various combined operating conditions for the Fernbank Zens site. Refer to Appendix C for the detailed list of the demands listed by node and operating condition.

Table 5.1: Hydraulic Model Demand – Fernbank Zens

Description	Demand
No. of Inhabitants	403
Average Daily Flow	1.31 L/s
Max. Daily Flow (MD)	3.92 L/s
Peak Hour Flow (PH)	5.88 L/s

*Includes future residential flows

Detailed hydraulic modeling of the proposed system network was conducted for the Fernbank Zens site to confirm the proposed layout has adequate capacity to service the development. The analysis pinpoints the minimum system pressures expected as a result of the maximum daily demand, the maximum daily demand plus fire flow and the peak hour demand design conditions. For watermain node network, refer to Appendix C for Fig WM-Proposed Watermain Layout and Nodes. Refer to Appendix C for the detailed results.

Table 5.2: Hydraulic Model Results – Fernbank Zens

Operating Condition	Minimum Operating Pressure
Max Daily Demand + Fire Flow	**Watermain**
MD = 0.61 L/s FF= 266.66 L/s at node N1	435.37 kPa 63.14 psi (at Node 3)
MD = 0.25 L/s FF= 250.00 L/s at node N4	258.10 kPa 37.43 psi (at Node 4)
MD = 0.49 L/s FF= 233.32 L/s at node N5	260.46 kPa 37.78 psi (at Node 5)
MD = 0.25 L/s FF= 233.32 L/s at node N6	260.46 kPa 37.78 psi (at Node 5)
Peak Hour Demand	
PH = 5.88 L/s	576.24 kPa 83.58 psi (At Node 6)
Maximum High Pressure	
MHP = Node N11	634.71 kPa 92.06 psi
Maximum Time On Site	
MTS = Node N4	19.5 hours

The results indicate that acceptable minimum system pressures will exist throughout the proposed distribution system under all design conditions.

The proposed water distribution system was checked for high pressures during average daily demand using a hydraulic boundary condition of 161.4m as provided by the City of Ottawa. The model indicates that pressures above 550 kPa (80 psi) exist within the site, up to a maximum of 634.71 kPa (92.06 psi). Therefore, pressure reducing valves will be required for all units. Refer to Appendix C for details.

5.4 Fire Flow Demands

The hydraulic analysis of the water distribution network demonstrated that the system has sufficient capacity to provide the required fire flows based on the Fire Underwriters Survey (FUS) calculations. Refer to Appendix C for detailed calculations for each building. The actual functionality of the system is limited by the available flow rate from each Hydrant. Existing and proposed hydrants are Class AA and the maximum available flow rate at each hydrant is 5,700 L/min. A further evaluation was conducted as per Technical Bulletin ISTB-2018-02 Appendix I: Guideline on Coordination of Hydrant Placement with Required Fire Flow. The results are summarized in Table 5.3: Fire Flow Results and in **Figure 7** - Fire Hydrant Coverage Plan.

Table 5.3: Fire Flow Results

Block	Fire Flow Demand (L/min)	Fire Hydrants within 75m	Fire Hydrants within 150m	*Available Fire Flow (L/min)
A	15,000	Existing Hydrant 1 Existing Hydrant 3	Existing Hydrant 2 Hydrant 1	19,000
B	16,000	Hydrant 1	Existing Hydrant 1 Existing Hydrant 2 Existing Hydrant 3 Hydrant 2	20,900
C	14,000	Hydrant 1	Existing Hydrant 1 Existing Hydrant 3 Hydrant 2 Hydrant 3	20,900
D	15,000	Hydrant 1 Hydrant 2	Hydrant 3	15,200
E	15,000	Hydrant 2 Hydrant 3	Hydrant 1 Hydrant 4 Hydrant 5	22,800
F	14,000	Hydrant 2 Hydrant 3	Hydrant 1 Hydrant 4 Hydrant 5	22,800
G	14,000	Hydrant 3 Hydrant 4 Hydrant 5	Hydrant 2	20,900
H	13,000	Hydrant 4 Hydrant 5	Hydrant 3	15,200
J	14,000	Hydrant 4 Hydrant 5	Hydrant 3	15,200

PATRIOT PLACE

FERNBANK ROAD

COPE DRIVE

TERRY FOX DRIVE

BLDG-A R.F.F.= 15,000 L/MIN

BLDG-B R.F.F.= 16,000 L/MIN

BLDG-C R.F.F.= 14,000 L/MIN

BLDG-D R.F.F.= 15,000 L/MIN

BLDG-E R.F.F.= 15,000 L/MIN

BLDG-F R.F.F.= 14,000 L/MIN

BLDG-G R.F.F.= 14,000 L/MIN

BLDG-H R.F.F.= 13,000 L/MIN

BLDG-J R.F.F.= 14,000 L/MIN

BLDG-K R.F.F.= 12,000 L/MIN

BLDG-L R.F.F.= 13,000L/MIN

BLDG-M R.F.F.= 13,000 L/MIN

BLDG-N R.F.F.= 13,000 L/MIN

BLDG-P R.F.F.= 12,000 L/MIN

BLDG-Q R.F.F.= 14,000L/MIN

BLDG-R R.F.F.= 14,000 L/MIN

H1 H2 H3 H4 H5

Fence 0.04 East

100mmCPP T/P=96.70 INV=96.60

LEGEND

- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- R.F.F. REQUIRED FIRE FLOW
- 75m COVERAGE RADIUS
- 150m COVERAGE RADIUS
- H2 PROPOSED HYDRANT
- H1 EXISTING HYDRANT

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
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Website www.novatech-eng.com

CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

FIRE HYDRANT COVERAGE PLAN

SCALE 1 : 1500 (0, 15, 30, 45, 60)

DATE NOV 2021 | JOB 121011 | FIGURE FIG-7

SHT11X17.DWG - 279mmX432mm

M:\2021\121011\DATA\Calculations\Sewer Calcs\Water\202105XX-Submission #1\202105I3-121011-HYDCOV.dwg, FIG 7, Oct 07, 2021 - 5:55pm, mmckeough

K	12,000	Hydrant 4 Hydrant 5	Hydrant 3	15,200
L	13,000	Hydrant 2 Hydrant 3	Hydrant 1 Hydrant 4 Hydrant 5	22,800
M	13,000	Hydrant 2	Hydrant 1 Hydrant 3	13,300
N	13,000	Hydrant 1	Existing Hydrant 1 Existing Hydrant 2 Hydrant 2	17,100
P	12,000	Existing Hydrant 1 Existing Hydrant 2	Hydrant 1	15,200
Q	14,000	Hydrant 1	Existing Hydrant 1 Existing Hydrant 2 Existing Hydrant 3 Hydrant 2	20,900
R	14,000	Hydrant 1	Existing Hydrant 1 Existing Hydrant 2 Existing Hydrant 3 Hydrant 2	20,900

* Existing and proposed hydrants are Class AA and the maximum available flow rate at each hydrant is 5,700 L/min.

The proposed water distribution system and the number of proposed hydrants satisfies the requirements for available flow based on Technical Bulletin ISTB-2018-02 Appendix I: Guideline on Coordination of Hydrant Placement with Required Fire Flow.

5.5 Watermain Conclusions

The water distribution network as proposed can provide an adequate system pressure for the maximum day plus fire and the peak hour design conditions at all nodes throughout the development. These adequate pressures can be achieved under the current conditions of existing infrastructure. The water distribution network also provides an adequate number of fire hydrants to meet the fire flow requirements for the proposed structures.

6.0 ROADWAYS

6.1 Roadway Characteristics

The Fernbank Zens development will have a roadway width of 6.7m throughout with parking areas along the sides.

6.2 Traffic

An analysis of the effect from the proposed Fernbank Zens development on the existing traffic patterns has been performed and detailed in the report*, Proposed Residential Development, 5331 Fernbank Road, Transportation Impact Assessment, completed by Novatech, Ref. No.: R-2020-053, dated June 2, 2021;* and is submitted under a separate cover. Please refer to this report for more details.

6.3 Pedestrian Facilities

There are 1.8m wide existing concrete sidewalks along Cope Drive and Fernbank Road and 1.8m wide pathways are proposed within the development. Pathway connections are provided through

the development between Cope Drive and Fernbank Road and east to Patriot Place in the existing SOHO development.

6.4 Noise

The analysis of the roadway traffic along Terry Fox Drive, Fernbank Road and Cope Drive indicates that the City of Ottawa's criteria for residential noise will be exceeded, primarily for units in close proximity to the noise sources. Attenuation measures are required and they may include the installation of central air conditioning, forced air ventilation, specified window and wall assemblies and/or a notice may be placed on title with regards to the noise levels to be expected. The detailed results are included in the Detailed Noise Control Study and is submitted under a separate cover. Refer to Fernbank *Zens, 5331 Fernbank Road, Detailed Noise Control Study, dated November 5, 2021 by Novatech, Report No.: R-2021-074* for more details.

7.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures will be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987).

Typical erosion and sediment control measures recommended include, but are not limited to, the use of silt fences around perimeter of site (OPSD 219.110), filter fabric or inserts under catch basin/maintenance hole lids, heavy duty silt fence barrier (OPSD 219.130), straw bale check dams (OPSD 219.180), rock check dams (219.210 or OPSD 219.211), riprap (OPSS 511), mud mats, silt bags for dewatering operations, topsoil and sod to disturbed areas and natural grassed waterways. Dewatering and sediment control techniques will be developed for the individual situations based on the above guidelines and utilizing typical measures to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent lands, water bodies or water treatment/conveyance facilities.

It will be the responsibility of the Contractor to submit a detailed construction schedule and appropriate staging, dewatering and erosion and sediment control plans to the Contract Administrator for review and approval prior to the commencement of work. A copy of the City of Ottawa Special Provision F-1004 is included in the Appendix which will become part of any contract and which outlines the contractual requirements which includes preparation of a detailed erosion and sediment control plan.

General

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.
- A qualified inspector should conduct daily visits during construction to ensure that the contractor is working in accordance with the design drawings and that mitigation measures are being implemented as specified.
    - A light duty silt fence barrier is to be installed in the locations shown on the Erosion and Sediment Control Plan.
    - Straw bale barriers are to be installed in drainage ditches.

  - Filter cloth is to be placed under the grates of all proposed and existing catchbasins and structures.
  - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.

- The contractor shall ensure that proper dust control is provided with the application of water (and if required, calcium chloride) during dry periods.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.
- The contractor acknowledges that failure to implement erosion and sediment control measures may result in penalties imposed by any applicable regulatory agency.

8.0 UTILITIES

The development will be serviced by hydro, phone, gas and cable, which will be constructed in a four-party trench, as per the City and utility standard right-of-way cross-sections. Canada Post will service the site with community mailboxes. Site lighting will be provided along roadways and walkways as per City standards.

9.0 PHASING

The proposed development will be constructed in one phase.

10.0 DEVIATIONS FROM SEWER DESIGN GUIDELINES

Specifics

The cover over the storm sewer in certain instances is less than the standard outlined in the City Sewer Design Guidelines as some of the storm sewers have been oversized for underground stormwater management in some locations. There are grade raise restrictions on this site which, if the site grading was raised to meet the minimum storm sewer cover over these few oversized pipes, there would be a corresponding large increase in the development cost with the use of lightweight fill over the entire site instead of some localized insulation over the oversized storm sewer laterals in certain areas.

11.0 CONCLUSIONS

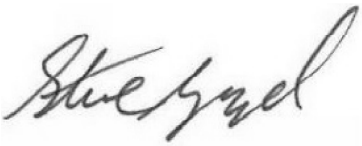
- Storm servicing for the development will be provided using a dual drainage system: minor system flows (up to the 2-year event) will be conveyed by storm sewers or stored underground, while major system flows will be stored at low points in the roadways and parking areas. Flows that exceed the provided storage will be conveyed overland along defined overland flow routes to either Cope Drive, Fernbank Road or Terry Fox Drive.
- Water quality control for the proposed development will be provided by the existing approved Vortechnics units located at the outfall to Cell 1 of the Monahan Drain Constructed Wetlands.
- Peak flows leaving the site will be less than the allowable release rate for both the minor and major systems and will therefore have no adverse impact on the existing development downstream.

- A minimum clearance of 0.30m will be provided between the 100-year hydraulic grade line (HGL) and the designed underside of footing elevations.
- Sanitary service will be provided by 200mm-diameter sanitary sewers within the development with an outlet connection at Cope Drive to an existing 525mm-diameter sanitary sewer.
- Water service will be provided by a 200mm-diameter watermain from Cope Drive connected at both the northwest private street connections and the northeast corner of the site to provide a loop, with a combination of 38mm, 50mm, 150mm and 200mm diameter watermain within the development.
- Local private roadways will be 6.7m throughout the site with parking areas situated along the sides. Internal pathways will be provided to give pedestrian access within and through the development and existing sidewalks along Cope Drive and Fernbank Road.
- Noise attenuation measures (noise wall) are not required on the site for the outdoor amenity areas. Building façade analysis was completed and the corresponding building requirements are outlined in the Detailed Noise Control Study.
- Erosion and sediment control measures (i.e. filter fabric, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.
- Erosion and sediment control measures associated with construction are to be implemented as outlined in Section 7.0.
- The development will be serviced by hydro, phone, gas and cable, which will be constructed in a three-party trench, as per the City and utility standard right-of-way cross-sections. Canada Post will service the site with community mailboxes. Site lighting will be provided along roadways and pathways as per City standards.

It is recommended that the City of Ottawa approve the findings of this report in support of the engineering detail design for the Fernbank Zen's site at 5331 Fernbank Road.

NOVATECH

Prepared by:



Steve Zorgel, P. Eng.
Project Coordinator

Reviewed/Approved by:

Drew Blair, P. Eng.
Project Manager

Appendix A

5331 Fernbank
Claridge Homes
Project No.: 121011

STORM SEWER DESIGN SHEET
5331 FERNBANK
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA							
Street	Catchment ID	From MH	To MH	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
	A1	CBMH16	218	0.04	0.52	0.02	0.058	0.058	10.00	76.81			4.4	10.6	0.254	250	PVC	0.45	39.6	41.6	0.82	0.80	25%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A2			0.04	0.72	0.03	0.080	0.138	10.00	76.81			10.6									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.80													
	A3	CBMH6	218	0.08	0.56	0.04	0.125	0.125	10.00	76.81			9.6	45.4	0.305	300	PVC	0.40	17.6	63.7	0.87	0.34	71%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A4			0.21	0.80	0.17	0.467	0.592	10.00	76.81			45.4									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.34													
		218	200			0.00	0.000	0.729	10.80	73.85			53.9	53.9	0.381	375	PVC	0.28	7.1	96.7	0.85	0.14	56%
						0.00	0.000	0.000	10.80													
						0.00	0.000	0.000	10.80													
	A5	200	202	0.09	0.78	0.07	0.195	0.925	10.94	73.36			67.8	67.8	0.381	375	PVC	0.25	48.0	91.4	0.80	1.00	74%
						0.00	0.000	0.000	10.94													
						0.00	0.000	0.000	10.94													
									11.94													
		CBMH5	202	0.12	0.83	0.10	0.277	0.277	10.00	76.81			21.3	21.3	0.254	250	PVC	0.50	20.1	43.8	0.86	0.39	49%
	A6					0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.39													
	A7	202	204	0.18	0.52	0.09	0.260	1.462	11.94	70.07			102.4	129.6	0.457	450	Conc	0.21	81.9	136.2	0.83	1.65	95%
						0.00	0.000	0.000	11.94													
						0.00	0.000	0.000	11.94													
	A8			0.07	0.49	0.03	0.095	1.557	11.94	70.07			109.1									
						0.00	0.000	0.000	11.94													
						0.00	0.000	0.000	11.94													
	A9			0.13	0.81	0.11	0.293	1.850	11.94	70.07			129.6									
						0.00	0.000	0.000	11.94													
						0.00	0.000	0.000	11.94													
									13.59													
	A10	CBMH4	204	0.19	0.57	0.11	0.301	0.301	10.00	76.81			23.1	43.9	0.305	300	PVC	0.35	20.0	59.6	0.82	0.41	74%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A11			0.12	0.81	0.10	0.270	0.571	10.00	76.81			43.9									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.41													

5331 Fernbank
Claridge Homes
Project No.: 121011

STORM SEWER DESIGN SHEET
5331 FERNBANK
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA							
Street	Catchment ID	From MH	To MH	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
		204	206			0.00	0.000	2.421	13.59	65.32			158.1	158.1	0.533	525	Conc	0.22	41.5	210.3	0.94	0.73	75%
						0.00	0.000	0.000	13.59													
						0.00	0.000	0.000	13.59													
									14.32													
	A12	CBMH7	206	0.32	0.76	0.24	0.676	0.676	10.00	76.81			51.9	51.9	0.305	300	PVC	0.35	25.4	59.6	0.82	0.52	87%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.52													
	A13	206	208	0.12	0.71	0.09	0.237	3.334	14.32	63.41			211.4	211.4	0.610	600	Conc	0.17	41.4	263.9	0.90	0.76	80%
						0.00	0.000	0.000	14.32													
						0.00	0.000	0.000	14.32													
									15.09													
	A14	CBMH3	208	0.15	0.58	0.09	0.242	0.242	10.00	76.81			18.6	39.3	0.305	300	PVC	0.35	20.0	59.6	0.82	0.41	66%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A15			0.12	0.81	0.10	0.270	0.512	10.00	76.81			39.3									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.41													
	A16	208	210	0.08	0.72	0.06	0.160	4.006	15.09	61.57			246.7	246.7	0.686	675	Conc	0.15	39.4	339.4	0.92	0.71	73%
						0.00	0.000	0.000	15.09													
						0.00	0.000	0.000	15.09													
									15.80													
	A17	CBMH1	220	0.12	0.37	0.04	0.123	0.123	10.00	76.81			9.5	30.9	0.305	300	PVC	0.35	22.9	59.6	0.82	0.47	52%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A18			0.13	0.77	0.10	0.278	0.402	10.00	76.81			30.9									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A19	220	210	0.14	0.80	0.11	0.311	0.713	10.47	75.06			53.5	53.5	0.381	375	PVC	0.26	30.9	93.2	0.82	0.63	57%
						0.00	0.000	0.000	10.47													
						0.00	0.000	0.000	10.47													
									11.10													

5331 Fernbank
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		210	212			0.00	0.000	4.719	15.80	59.94			282.9	282.9	0.762	750	Conc	0.11	43.5	385.0	0.84	0.86	73%
						0.00	0.000	0.000	15.80													
						0.00	0.000	0.000	15.80													
									16.66													
	A20	CBMH2	212	0.17	0.57	0.10	0.269	0.269	10.00	76.81			20.7	63.4	0.381	375	PVC	0.25	20.0	91.4	0.80	0.42	69%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A21			0.25	0.80	0.20	0.556	0.825	10.00	76.81			63.4									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.42													
	A22	CBMH8	222	0.05	0.50	0.03	0.070	0.070	10.00	76.81			5.3	27.5	0.254	250	PVC	0.45	22.0	41.6	0.82	0.45	66%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
	A23			0.14	0.74	0.10	0.288	0.358	10.00	76.81			27.5									
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
									10.45													
	A24	CBMH10	230	0.15	0.69	0.10	0.288	0.288	10.00	76.81			22.1	22.1	0.254	250	PVC	0.55	5.5	46.0	0.91	0.10	48%
						0.00	0.000	0.000	10.00													
						0.00	0.000	0.000	10.00													
		230	222			0.00	0.000	0.288	10.10	76.42			22.0	22.0	0.254	250	PVC	0.47	17.0	42.5	0.84	0.34	52%
						0.00	0.000	0.000	10.10													
						0.00	0.000	0.000	10.10													
									10.44													
		222	224			0.00	0.000	0.645	10.45	75.13			48.5	48.5	0.381	375	PVC	0.29	17.1	98.4	0.86	0.33	49%
						0.00	0.000	0.000	10.45													
						0.00	0.000	0.000	10.45													
									10.78													

5331 Fernbank
Claridge Homes
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LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA								
Street	Catchment ID	From MH	To MH	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
	A25	CBMH9	224	0.09	0.39	0.04	0.098	0.098	10.00	76.81			7.5	35.9	0.305	300	PVC	0.35	19.6	59.6	0.82	0.40	60%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
	A26			0.18	0.74	0.13	0.370	0.468	10.00	76.81			35.9										
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									10.40														
		224	212			0.00	0.000	1.113	10.78	73.94			82.3	82.3	0.457	450	Conc	0.20	44.9	132.9	0.81	0.92	62%
						0.00	0.000	0.000	10.78														
						0.00	0.000	0.000	10.78														
									11.70														
		212	214			0.00	0.000	6.658	16.66	58.11			386.9	386.9	0.838	825	Conc	0.11	37.4	496.4	0.90	0.69	78%
						0.00	0.000	0.000	16.66														
						0.00	0.000	0.000	16.66														
Cope	**A27**	214	EX 1013MH	0.07	0.70	0.05	0.136	6.794	17.35	56.72			385.4	**385.4**	0.838	825	Conc	0.11	18.0	496.4	0.90	0.33	78%
						0.00	0.000	0.000	17.35														
						0.00	0.000	0.000	17.35														
									17.68														

Q = 2.78 AIC, where
Q = Peak Flow in Litres per Second (L/s)
C = Runoff Coefficient
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr)

Consultant:	**Novatech**
Date:	June 2, 2021
Revised:	September 30, 2021
Revised:	
Revised:	
Design By:	Matt McKeough
Client:	**Dwg. Reference:** / **Checked By:**
Claridge Homes	121011-STM / DDB

Legend:

*	Areas/Runoff Coefficients/Time of Concentration based on detailed storm design sheet and drawing (121011-STM)
10.00	Storm sewers designed to the 2 year event (without ponding) for local roads
10.00	Storm sewers designed to the 5 year event (without ponding) for collector roads
10.00	Storm sewers designed to the 10 year event (without ponding) for arterial roads

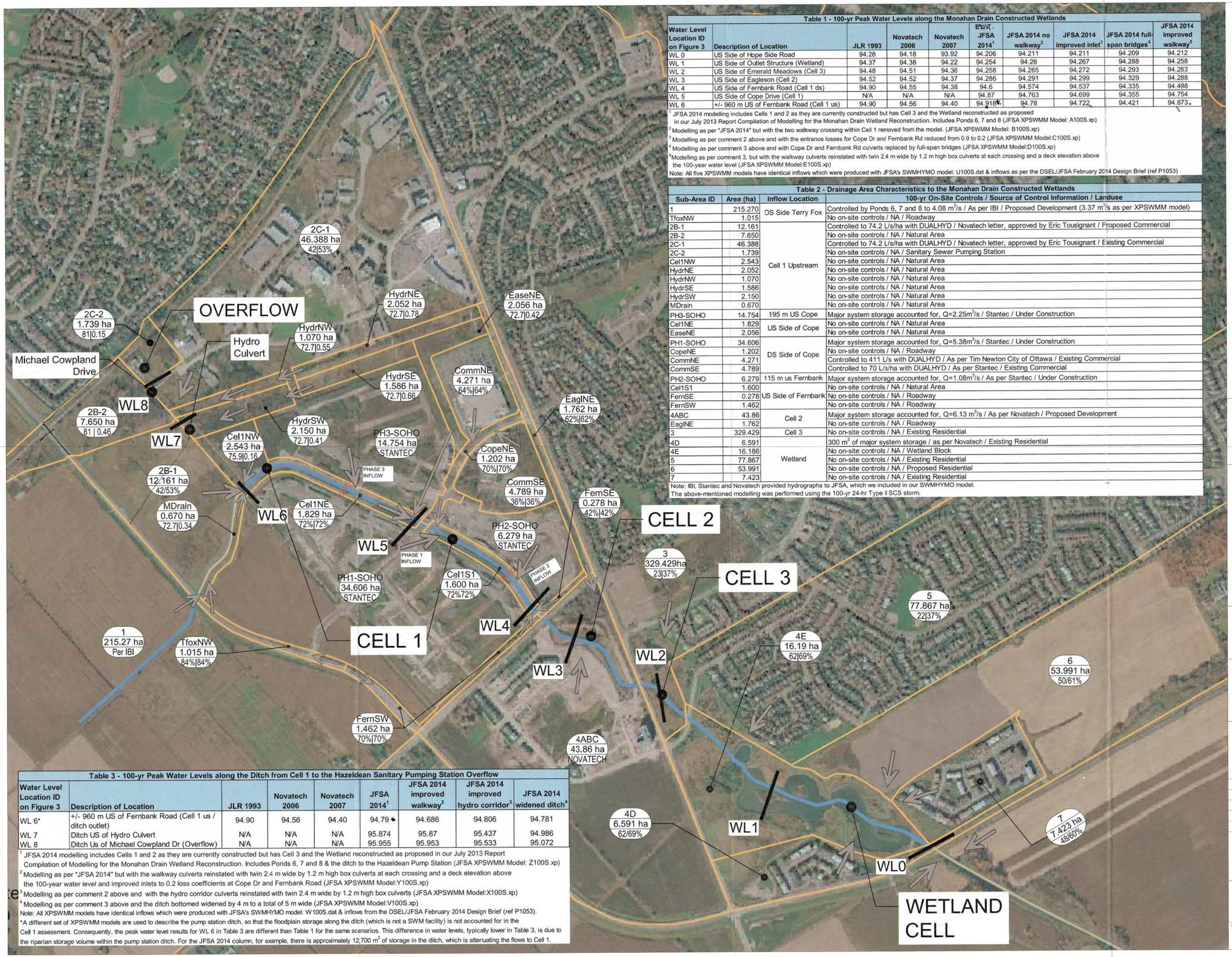

Table 1 - 100-yr Peak Water Levels along the Monahan Drain Constructed Wetlands

Water Level Location ID on Figure 3	Description of Location	JLR 1993	Novatech 2006	Novatech 2007	Exist. JFSA 2014[1]	JFSA 2014 no walkway[2]	JFSA 2014 improved inlet[3]	JFSA 2014 full-span bridges[4]	JFSA 2014 improved walkway[5]
WL 0	US Side of Hope Side Road	94.28	94.18	93.92	94.206	94.211	94.211	94.209	94.212
WL 1	US Side of Outlet Structure (Wetland)	94.37	94.38	94.22	94.254	94.26	94.267	94.288	94.258
WL 2	US Side of Emerald Meadows (Cell 3)	94.48	94.51	94.36	94.258	94.265	94.272	94.293	94.263
WL 3	US Side of Eagleson (Cell 2)	94.52	94.52	94.37	94.286	94.291	94.299	94.329	94.288
WL 4	US Side of Fernbank Road (Cell 1 ds)	94.90	94.55	94.38	94.6	94.574	94.537	94.335	94.498
WL 5	US Side of Cope Drive (Cell 1)	N/A	N/A	N/A	94.87	94.763	94.699	94.355	94.754
WL 6	+/- 960 m US of Fernbank Road (Cell 1 us)	94.90	94.56	94.40	94.918	94.78	94.722	94.421	94.873

[1] JFSA 2014 modelling includes Cells 1 and 2 as they are currently constructed but has Cell 3 and the Wetland reconstructed as proposed in our July 2013 Report Compilation of Modelling for the Monahan Drain Wetland Reconstruction. Includes Ponds 6, 7 and 8 (JFSA XPSWMM Model: A100S.xp)

[2] Modelling as per "JFSA 2014" but with the two walkway crossing within Cell 1 removed from the model. (JFSA XPSWMM Model: B100S.xp)

[3] Modelling as per comment 2 above and with the entrance losses for Cope Dr and Fernbank Rd reduced from 0.9 to 0.2 (JFSA XPSWMM Model:C100S.xp)

[4] Modelling as per comment 3 above and with Cope Dr and Fernbank Rd culverts replaced by full-span bridges (JFSA XPSWMM Model:D100S.xp)

[5] Modelling as per comment 3, but with the walkway culverts reinstated with twin 2.4 m wide by 1.2 m high box culverts at each crossing and a deck elevation above the 100-year water level (JFSA XPSWMM Model:E100S.xp)

Note: All five XPSWMM models have identical inflows which were produced with JFSA's SWMHYMO model: U100S.dat & inflows as per the DSEL/JFSA February 2014 Design Brief (ref P1053)

Table 2 - Drainage Area Characteristics to the Monahan Drain Constructed Wetlands

Sub-Area ID	Area (ha)	Inflow Location	100-yr On-Site Controls / Source of Control Information / Landuse
1	215.270	DS Side Terry Fox	Controlled by Ponds 6, 7 and 8 to 4.08 m^3/s / As per IBI / Proposed Development (3.37 m^3/s as per XPSWMM model)
TfoxNW	1.015		No on-site controls / NA / Roadway
2B-1	12.161	Cell 1 Upstream	Controlled to 74.2 L/s/ha with DUALHYD / Novatech letter, approved by Eric Tousignant / Proposed Commercial
2B-2	7.650		No on-site controls / NA / Natural Area
2C-1	46.388		Controlled to 74.2 L/s/ha with DUALHYD / Novatech letter, approved by Eric Tousignant / Existing Commercial
2C-2	1.739		No on-site controls / NA / Sanitary Sewer Pumping Station
Cel1NW	2.543		No on-site controls / NA / Natural Area
HydrNE	2.052		No on-site controls / NA / Natural Area
HydrNW	1.070		No on-site controls / NA / Natural Area
HydrSE	1.586		No on-site controls / NA / Natural Area
HydrSW	2.150		No on-site controls / NA / Natural Area
MDrain	0.670		No on-site controls / NA / Natural Area
PH3-SOHO	14.754	195 m US Cope	Major system storage accounted for, Q=2.25m^3/s / Stantec / Under Construction
Cel1NE	1.829	US Side of Cope	No on-site controls / NA / Natural Area
EaseNE	2.056		No on-site controls / NA / Natural Area
PH1-SOHO	34.606	DS Side of Cope	Major system storage accounted for, Q=5.38m^3/s / Stantec / Under Construction
CopeNE	1.202		No on-site controls / NA / Roadway
CommNE	4.271		Controlled to 411 L/s with DUALHYD / As per Tim Newton City of Ottawa / Existing Commercial
CommSE	4.789		Controlled to 70 L/s/ha with DUALHYD / As per Stantec / Existing Commercial
PH2-SOHO	6.279	115 m us Fernbank	Major system storage accounted for, Q=1.08m^3/s / As per Stantec / Under Construction
Cel1S1	1.600	US Side of Fernbank	No on-site controls / NA / Natural Area
FernSE	0.278		No on-site controls / NA / Roadway
FernSW	1.462		No on-site controls / NA / Roadway
4ABC	43.86	Cell 2	Major system storage accounted for, Q=6.13 m^3/s / As per Novatech / Proposed Development
EagINE	1.762		No on-site controls / NA / Roadway
3	329.429	Cell 3	No on-site controls / NA / Existing Residential
4D	6.591	Wetland	300 m^3 of major system storage / as per Novatech / Existing Residential
4E	16.186		No on-site controls / NA / Wetland Block
5	77.867		No on-site controls / NA / Existing Residential
6	53.991		No on-site controls / NA / Proposed Residential
7	7.423		No on-site controls / NA / Existing Residential

Note: IBI, Stantec and Novatech provided hydrographs to JFSA, which we included in our SWMHYMO model.
The above-mentioned modelling was performed using the 100-yr 24-hr Type II SCS storm.

Table 3 - 100-yr Peak Water Levels along the Ditch from Cell 1 to the Hazeldean Sanitary Pumping Station Overflow

Water Level Location ID on Figure 3	Description of Location	JLR 1993	Novatech 2006	Novatech 2007	JFSA 2014[1]	JFSA 2014 improved walkway[2]	JFSA 2014 improved hydro corridor[3]	JFSA 2014 widened ditch[4]
WL 6*	+/- 960 m US of Fernbank Road (Cell 1 us / ditch outlet)	94.90	94.56	94.40	94.79	94.686	94.806	94.781
WL 7	Ditch US of Hydro Culvert	N/A	N/A	N/A	95.874	95.87	95.437	94.986
WL 8	Ditch Us of Michael Cowpland Dr (Overflow)	N/A	N/A	N/A	95.955	95.953	95.533	95.072

[1] JFSA 2014 modelling includes Cells 1 and 2 as they are currently constructed but has Cell 3 and the Wetland reconstructed as proposed in our July 2013 Report Compilation of Modelling for the Monahan Drain Wetland Reconstruction. Includes Ponds 6, 7 and 8 & the ditch to the Hazeldean Pump Station (JFSA XPSWMM Model: Z100S.xp)

[2] Modelling as per "JFSA 2014" but with the walkway culverts reinstated with twin 2.4 m wide by 1.2 m high box culverts at each crossing and a deck elevation above the 100-year water level and improved inlets to 0.2 loss coefficients at Cope Dr and Fernbank Road (JFSA XPSWMM Model:Y100S.xp)

[3] Modelling as per comment 2 above and with the hydro corridor culverts reinstated with twin 2.4 m wide by 1.2 m high box culverts (JFSA XPSWMM Model:X100S.xp)

[4] Modelling as per comment 3 above and the ditch bottomed widened by 4 m to a total of 5 m wide (JFSA XPSWMM Model:V100S.xp)

Note: All XPSWMM models have identical inflows which were produced with JFSA's SWMHYMO model: W100S.dat & inflows from the DSEL/JFSA February 2014 Design Brief (ref P1053).

*A different set of XPSWMM models are used to describe the pump station ditch, so that the floodplain storage along the ditch (which is not a SWM facility) is not accounted for in the Cell 1 assessment. Consequently, the peak water level results for WL 6 in Table 3 are different than Table 1 for the same scenarios. This difference in water levels, typically lower in Table 3, is due to the riparian storage volume within the pump station ditch. For the JFSA 2014 column, for example, there is approximately 12,700 m^3 of storage in the ditch, which is attenuating the flows to Cell 1.

LEGEND :

- SUBCATCHMENT BOUNDARY
- MONAHAN DRAIN
- DRAINAGE DIRECTION / INFLOW LOCATION TO XPSWMM
- 5 / 77.87 ha / 22/37% — SUB-CATCHMENT ID (STANDHYD) / SUB-CATCHMENT AREA (HA) / DIRECT / TOTAL IMPERVIOUSNESS (%)
- 13 / 121.65 ha / 75.7|1.3 — SUB-CATCHMENT ID (NASHYD) / SUB-CATCHMENT AREA (HA) / CURVE NUMBER | TIME TO PEAK (H)
- WL1 WATER LEVEL LOCATION refer to Table 1
- APPROXIMATE LOCATION of WALKWAYS

SCALE :

0 125 250 375 500 m

N

J.F. Sabourin & Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS
OTTAWA (613) 836-3884
GATINEAU (819) 243-6858

CLIENT : Ottawa

PROJECT :

CELL 1 MODELLING
MONAHAN DRAIN CONSTRUCTED WETLANDS

CB	Sept/14	FINAL	3
CB	Feb/13	For Review / Comments	2
CB	Dec/13	For Discussion	1
CB	Sept/13	For Discussion	0
BY	DATE	DESCRIPTION	REV

DETAILED DRAINAGE AREAS TO CELL 1 + WATER LEVELS ALONG the MDCW

FIGURE 3

DESIGNED:
DRAWN: CB
VERIFIED:
APPROVED:

DRAWING REF.
902(03)-13\Design\CAD\JFSA Figures 20140905.dwg

DATE: Sept/14
PROJECT No.: 902(03)-13

ORIGINAL SHEET – ISO A1

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2009-02-26 09:20AM By: gwalk

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Ottawa ON Canada
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Legend

- DRAINAGE AREA NO. / RUNOFF COEFFICIENT / STORM DRAINAGE AREA (ha)
- DRAINAGE AREA BOUNDARY
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN (ALL ROAD CB'S TO INCLUDE PERFORATED STUB DRAINS EXTENDING OUT FROM THE CB IN TWO DIRECTIONS PARALLEL TO THE ROADWAY. THESE DRAINS ARE TO BE INSTALLED AT THE BOTTOM OF THE SUBBASE LAYER.)
- PROPOSED SUBDRAIN CATCH BASIN
- PROPOSED 250ø PERFORATED PIPE
- (C) STREET CATCHBASINS TO BE INTERCONNECTED WITH ONLY ONE CONNECTION TO STORM SEWER PER PAIR WHERE NOTED.
- (A) IPEX TYPE 'A' TO BE INSTALLED IN STREET AND REAR YARD CATCHBASINS WHERE NOTED.
- (1) PROPOSED CATCH BASIN / MANHOLE c/w IPEX INLET-CONTROL DEVICE TYPE 'A' OR APPROVED EQUIVALENT
- PONDING AREA LIMITS
- DEPTH=0.20m MAXIMUM PONDING DEPTH
- DIRECTION OF OVERLAND FLOW
- FUTURE PHASE OF STORM DRAINAGE WORKS

Notes

1. IPEX TYPE 'A' TO RESTRICT FLOWS TO THE STORM SEWER TO 22L/s AT 1.8m HEAD.

7	REVISED DRIVEWAY & SIDEWALK LOCATIONS, ISSUED FOR FINAL APPROVAL	KJK	JBL	09.02.25
5	REVISED LOT GRADING AND SERVICING	KJK	JBL	08.11.03
4	ISSUED FOR CONSTRUCTION	KJK	JBL	08.01.21
3	REVISED AS PER CITY COMMENTS AND FINAL APPROVAL	KJK	JBL	07.10.29
2	REVISED AS PER CITY COMMENTS	KJK	JBL	07.08.17
1	ISSUED FOR CITY COMMENTS	KJK	JBL	07.07.12
Revision		By	Appd.	YY.MM.DD
File Name: 160400502C-SD		KJK	JBL	KJK 07.03.14
		Dwn.	Chkd.	Dsgn. YY.MM.DD

Permit-Seal

Client/Project

CAVANAGH CONSTRUCTION LTD.

SOHO - KANATA SOUTH

Ottawa ON Canada

Title

OVERALL
STORM DRAINAGE PLAN

Project No.	Scale	
160400502C	1:2000 (0, 20, 60, 100m)	
Drawing No.	Sheet	Revision
OSD	49 of 58	7

Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Model Results (Ponding)

NOVATECH
Engineers, Planners & Landscape Architects

CB ID	Invert Elev. (m)	Rim Elev. (m)	Spill Elev. (m)	Ponding Depth (m)	HGL Elev. (m)[1]				Ponding Depth (m)				Spill Depth (m)			
					2-yr	5-yr	100-yr	100-yr (+20%)	2-yr	5-yr	100-yr	100-yr (+20%)	2-yr	5-yr	100-yr	100-yr (+20%)
CBMH01	94.86	96.85	97.15	0.30	96.75	96.91	97.04	97.08	0.00	0.06	0.19	0.23	0.00	0.00	0.00	0.00
CBMH02	94.64	96.70	97.00	0.30	96.29	96.79	96.99	97.06	0.00	0.09	0.29	0.36	0.00	0.00	0.00	0.06
CBMH03	94.83	96.85	97.15	0.30	96.43	96.94	97.16	97.19	0.00	0.09	0.31	0.34	0.00	0.00	0.01	0.04
CBMH04	94.98	97.15	97.45	0.30	97.03	97.27	97.45	97.46	0.00	0.12	0.30	0.31	0.00	0.00	0.00	0.01
CBMH05	95.23	97.30	97.60	0.30	97.30	97.37	97.47	97.50	0.00	0.07	0.17	0.20	0.00	0.00	0.00	0.00
CBMH06	95.34	97.35	97.65	0.30	96.31	97.11	97.58	97.64	0.00	0.00	0.23	0.29	0.00	0.00	0.00	0.00
CBMH07	94.92	96.95	97.25	0.30	96.95	97.03	97.19	97.27	0.00	0.08	0.24	0.32	0.00	0.00	0.00	0.02
CBMH08	94.95	96.85	97.15	0.30	96.78	97.00	97.16	97.17	0.00	0.15	0.31	0.32	0.00	0.00	0.01	0.02
CBMH09	94.83	96.80	97.10	0.30	96.35	96.87	97.03	97.11	0.00	0.07	0.23	0.31	0.00	0.00	0.00	0.01
CBMH10	95.02	96.85	97.15	0.30	96.21	96.93	97.16	97.17	0.00	0.08	0.31	0.32	0.00	0.00	0.01	0.02
CBMH11	95.21	96.80	97.10	0.30	96.80	96.90	97.03	97.15	0.00	0.10	0.23	0.35	0.00	0.00	0.00	0.05
CBMH12	94.81	96.83	97.13	0.30	96.67	96.90	97.10	97.18	0.00	0.07	0.27	0.35	0.00	0.00	0.00	0.05
CBMH13	94.82	96.83	97.13	0.30	96.70	96.96	97.10	97.18	0.00	0.13	0.27	0.35	0.00	0.00	0.00	0.05
CBMH14	95.18	97.25	97.55	0.30	97.20	97.39	97.55	97.57	0.00	0.14	0.30	0.32	0.00	0.00	0.00	0.02
CBMH15	95.60	97.30	97.60	0.30	97.28	97.37	97.48	97.53	0.00	0.07	0.18	0.23	0.00	0.00	0.00	0.00
CBMH16	95.50	97.45	97.50	0.05	95.78	96.04	97.20	97.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE01	95.48	97.45	97.60	0.15	96.31	97.11	97.58	97.64	0.00	0.00	0.13	0.19	0.00	0.00	0.00	0.04
RYE02	95.62	97.20	97.35	0.15	95.78	96.05	97.21	97.41	0.00	0.00	0.01	0.21	0.00	0.00	0.00	0.06
RYE03	95.78	97.70	97.95	0.25	97.20	97.40	97.53	97.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE04	95.60	97.30	97.60	0.30	97.20	97.39	97.55	97.60	0.00	0.09	0.25	0.30	0.00	0.00	0.00	0.00
RYE05	95.62	97.35	97.60	0.25	97.03	97.28	97.45	97.49	0.00	0.00	0.10	0.14	0.00	0.00	0.00	0.00
RYE06	95.45	97.05	97.30	0.25	96.44	96.98	97.34	97.41	0.00	0.00	0.29	0.36	0.00	0.00	0.04	0.11
RYE07	95.02	96.85	97.20	0.35	96.75	96.92	97.05	97.10	0.00	0.07	0.20	0.25	0.00	0.00	0.00	0.00
RYE08	95.25	96.85	97.07	0.22	96.30	96.85	97.15	97.19	0.00	0.00	0.30	0.34	0.00	0.00	0.08	0.12
RYE09	95.25	96.85	97.10	0.25	96.29	96.80	96.99	97.08	0.00	0.00	0.14	0.23	0.00	0.00	0.00	0.00
RYE10	95.68	97.00	97.20	0.20	96.78	97.00	97.17	97.21	0.00	0.00	0.17	0.21	0.00	0.00	0.00	0.01
RYE11	95.15	96.80	97.10	0.30	96.35	96.87	97.03	97.11	0.00	0.07	0.23	0.31	0.00	0.00	0.00	0.01
RYE12	95.55	97.25	97.55	0.30	97.20	97.39	97.55	97.58	0.00	0.14	0.30	0.33	0.00	0.00	0.00	0.03
RYT01	95.36	97.30	97.65	0.35	96.31	97.11	97.58	97.64	0.00	0.00	0.28	0.34	0.00	0.00	0.00	0.00
RYT02	95.53	97.25	97.60	0.35	97.20	97.39	97.53	97.53	0.00	0.14	0.28	0.28	0.00	0.00	0.00	0.00
RYT03	95.25	97.25	97.55	0.30	97.20	97.39	97.55	97.58	0.00	0.14	0.30	0.33	0.00	0.00	0.00	0.03
RYT04	95.42	97.15	97.45	0.30	97.03	97.28	97.45	97.48	0.00	0.13	0.30	0.33	0.00	0.00	0.00	0.03
RYT05	95.14	97.05	97.40	0.35	97.03	97.28	97.45	97.48	0.00	0.23	0.40	0.43	0.00	0.00	0.05	0.08
RYT06	94.99	96.85	97.20	0.35	96.43	96.94	97.16	97.18	0.00	0.09	0.31	0.33	0.00	0.00	0.00	0.00
RYT07	94.87	96.70	97.05	0.35	96.29	96.79	96.99	97.07	0.00	0.09	0.29	0.37	0.00	0.00	0.00	0.02
RYT09	95.70	97.55	97.70	0.15	97.20	97.40	97.53	97.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[1] *3-hour Chicago Storm.*

Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Model Results (HGL)

NOVATECH
Engineers, Planners & Landscape Architects

MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)	HGL in Stress Test[1] (m)
MH200	95.50	96.60	95.40	0.00	1.20	95.41
MH202	95.38	96.57	95.29	0.00	1.28	95.30
MH204	95.22	96.42	95.20	0.00	1.22	95.21
MH206	95.13	96.26	95.17	0.04	1.09	95.18
MH208	95.07	96.03	95.14	0.07	0.89	95.15
MH210	95.01	96.09	95.12	0.11	0.97	95.12
MH212	94.97	95.94	95.10	0.13	0.84	95.11
MH214	94.93	95.91	95.08	0.15	0.83	95.09
MH218	95.58	96.54	95.48	0.00	1.06	95.49
MH220	95.09	96.16	95.14	0.05	1.02	95.15
MH222	95.11	96.12	95.13	0.02	0.99	95.14
MH224	95.06	95.97	95.12	0.06	0.85	95.13
MH230	95.18	96.03	95.16	0.00	0.87	95.17

[1] *3-hour Chicago Storm.*

Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Storage Curves

NOVATECH
Engineers, Planners & Landscape Architects

CBMH01			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.86	0.00	1.13	0.0
96.85	1.99	1.13	2.2
97.15	2.29	575.00	88.7
97.16	2.30	0.00	91.5
97.85	2.99	0.00	91.5

CBMH02			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.64	0.00	1.13	0.0
96.70	2.06	1.13	2.3
96.70	2.061	0.36	2.3
97.00	2.36	527.00	81.2
97.01	2.37	0.00	83.8
97.70	3.06	0.00	83.8

CBMH03			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.83	0.00	1.13	0.0
96.85	2.02	1.13	2.3
96.85	2.021	0.36	2.3
97.15	2.32	300.00	47.2
97.16	2.33	0.00	48.7
97.85	3.02	0.00	48.7

CBMH04			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.98	0.00	1.13	0.0
97.15	2.17	1.13	2.5
97.45	2.47	300.00	47.6
97.46	2.48	0.00	49.1
98.15	3.17	0.00	49.1

CBMH05			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.23	0.00	1.90	0.0
97.30	2.07	1.90	3.9
97.30	2.07	0.36	3.9
97.60	2.37	393.00	62.7
97.61	2.38	0.00	64.7
98.30	3.07	0.00	64.7

CBMH06			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.34	0.00	5.00	0.0
97.35	2.01	5.00	10.1
97.35	2.011	0.36	10.1
97.65	2.31	300.00	55.0
97.66	2.32	0.00	56.5
98.35	3.01	0.00	56.5

CBMH07			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.92	0.00	6.35	0.0
96.95	2.03	6.35	12.9
96.95	2.031	0.36	12.9
97.25	2.33	353.00	65.7
97.26	2.34	0.00	67.5
97.95	3.03	0.00	67.5

CBMH08			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.95	0.00	3.25	0.0
96.85	1.90	3.25	6.2
96.85	1.901	0.36	6.2
97.15	2.20	200.00	36.1
97.16	2.21	0.00	37.1
97.85	2.90	0.00	37.1

CBMH09			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.83	0.00	1.13	0.0
96.80	1.97	1.13	2.2
96.80	1.971	0.36	2.2
97.10	2.27	733.00	111.9
97.11	2.28	0.00	115.5
97.80	2.97	0.00	115.5

CBMH10			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.02	0.00	4.30	0.0
96.85	1.83	4.30	7.9
96.85	1.831	0.36	7.9
97.15	2.13	120.00	25.9
97.16	2.14	0.00	26.5
97.85	2.83	0.00	160.7

CBMH11			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.21	0.00	4.50	0.0
96.80	1.59	4.50	7.2
96.80	1.591	0.36	7.2
97.10	1.89	255.00	45.3
97.11	1.90	0.00	46.6
97.80	2.59	0.00	46.6

CBMH12			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.81	0.00	2.70	0.0
96.83	2.02	2.70	5.5
96.83	2.02	0.36	5.5
97.13	2.32	267.00	45.4
97.14	2.33	0.00	46.8
97.83	3.02	0.00	46.8

CBMH13			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
94.82	0.00	5.00	0.0
96.83	2.01	5.00	10.1
96.83	2.01	0.36	10.1
97.13	2.31	133.00	30.0
97.14	2.32	0.00	30.7
97.83	3.01	0.00	30.7

CBMH14			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.18	0.00	1.13	0.0
97.25	2.07	1.13	2.3
97.25	2.07	0.36	2.3
97.55	2.37	200.00	32.3
97.56	2.38	0.00	33.3
98.25	3.07	0.00	33.3

CBMH15			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.60	0.00	1.13	0.0
97.30	1.70	1.13	1.9
97.60	2.00	233.00	37.0
97.61	2.01	0.00	38.2
98.30	2.70	0.00	38.2

RYE03			
Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
95.78	0.00	0.36	0.0
97.70	1.92	0.36	0.7
97.95	2.17	32.00	4.7
97.96	2.18	0.00	4.9
98.70	2.92	0.00	4.9

RYE04			
Elevation (m)	Depth (m)	Area (m2)	Volume (m3)
95.37	0.00	0.36	0.0
98.30	2.93	0.36	1.1
98.60	3.23	87.00	14.2
98.61	3.24	0.00	14.6
99.30	3.93	0.00	14.6

RYE07			
Elevation (m)	Depth (m)	Area (m2)	Volume (m3)
95.02	0.00	0.36	0.0
96.80	1.78	0.36	0.6
97.15	2.13	105.00	19.1
97.16	2.14	0.00	19.6
97.80	2.78	0.00	19.6

RYE12			
Elevation (m)	Depth (m)	Area (m2)	Volume (m3)
95.55	0.00	0.36	0.0
97.25	1.70	0.36	0.6
97.55	2.00	100.00	15.7
97.56	2.01	0.00	16.2
98.25	2.70	0.00	16.2

RYT02			
Elevation (m)	Depth (m)	Area (m2)	Volume (m3)
95.53	0.00	0.36	0.0
97.25	1.72	0.36	0.6
97.60	2.07	200.00	35.7
97.61	2.08	0.00	36.7
98.25	2.72	0.00	36.7

RYT03			
Elevation (m)	Depth (m)	Area (m2)	Volume (m3)
95.22	0.00	0.36	0.0
97.25	2.03	0.36	0.7
97.55	2.33	100.00	15.8
97.56	2.34	0.00	16.3
98.25	3.03	0.00	16.3

RYT09			
Elevation (m)	Depth (m)	Area (m2)	Volume (m3)
95.70	0.00	0.36	0.0
97.55	1.85	0.36	0.7
97.70	2.00	27.00	2.7
97.71	2.01	0.00	2.9
98.55	2.85	0.00	2.9

Fernbank Zens - 5331 Fernbank Road (121011)
Outlet Rating Curves

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ICD Size (mm)	83	94	102	108	127	152	178
Head (m)	Outflow (L/s)	Outflow (L/s)	Outflow (L/s)	Outflow (L/s)	Outflow (L/s)	Outflow (L/s)	Outflow (L/s)
0.000	0	0	0	0	0	0	0
0.010	1	1	1	1	1	1	1
0.015	3	3	3	3	3	3	3
0.021	6	6	6	6	6	6	6
0.030	12	12	12	12	12	12	12
0.040	18	20	20	20	20	20	20
0.050	18	23	27	30	30	30	30
0.054	18	23	27	31	34	34	34
0.060	18	23	27	31	40	40	40
0.080	18	23	27	31	43	50	50
1.000	18	23	27	31	43	50	50

**CB's on-grade max capture rate = 50 L/s*

Parameter	ICD Size and Release Rate @ 1.5m Head						
Q (L/s) =	18.20	23.34	27.48	30.81	42.61	61.03	83.70
g (m/s^2) =	9.81	9.81	9.81	9.81	9.81	9.81	9.81
h (m) =	1.50	1.50	1.50	1.50	1.50	1.50	1.50
A (m^2) =	0.0054	0.0069	0.0082	0.0092	0.0127	0.0181	0.0249
D (m) =	0.083	0.094	0.102	0.108	0.127	0.152	0.178
D (mm) =	83	94	102	108	127	152	178

Q = 0.62xAx(2gh)^0.5

TEMPEST Product Submittal Package

Date: September 28, 2021

Customer: Novatech

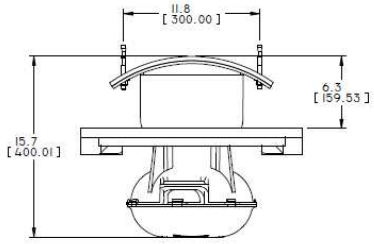
Contact: Lucas Wilson

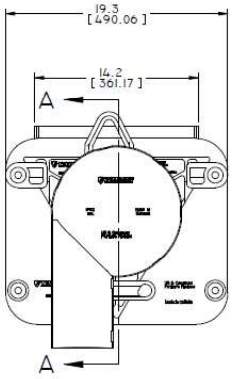
Location: Ottawa

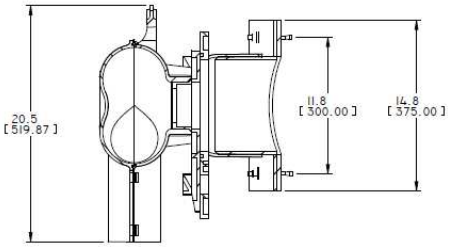
Project Name: Fernbank Zens Lands

IPEX

Tempest LMF ICD Rd Shop Drawing





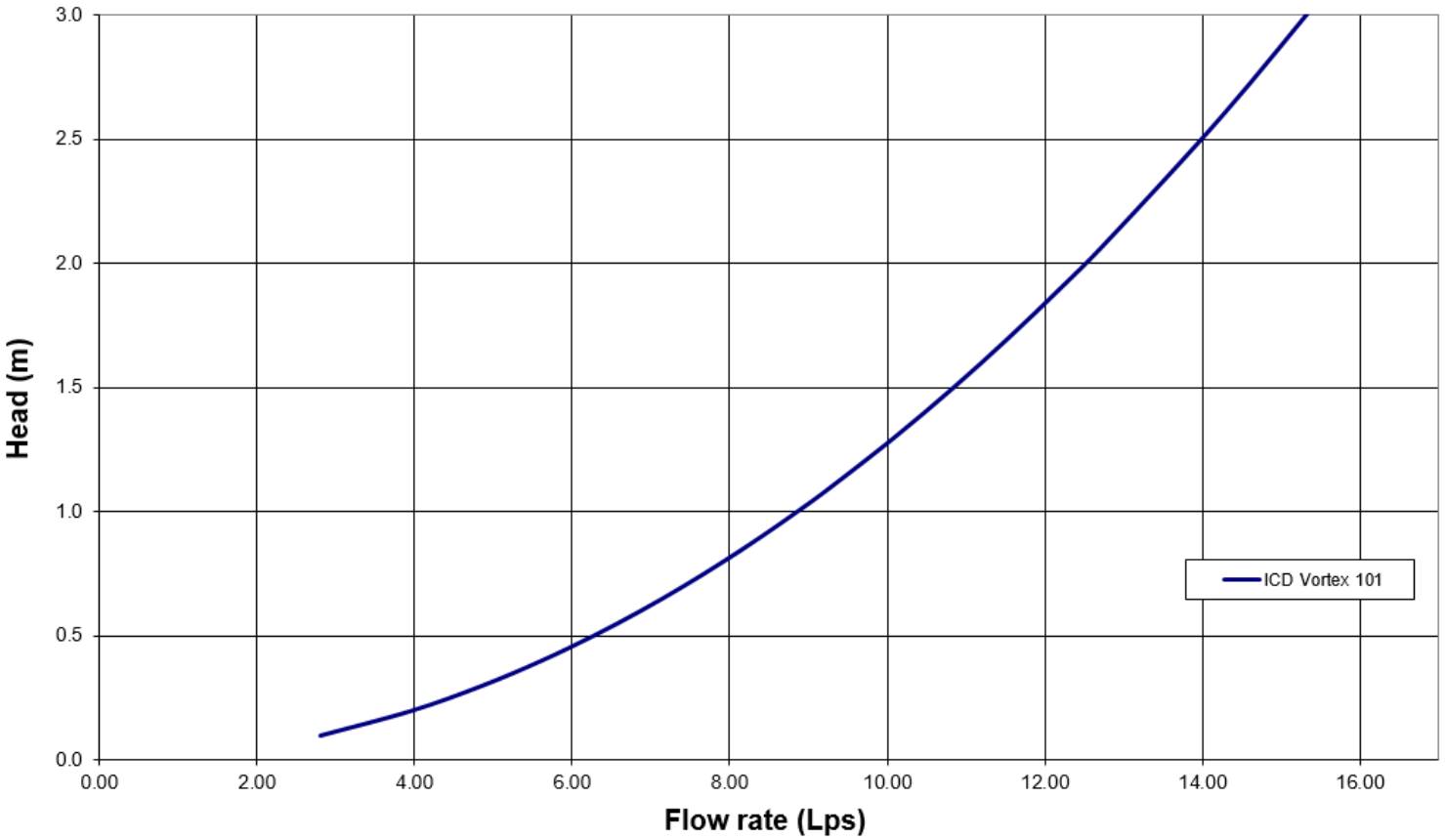


SECTION A-A

IPEX TECHNOLOGIES INC.	PROJECTION	UNITS	TITLE	LMF ROUND CB ASSEMBLY
		in (mm)		
DRAWN BY: H. M-MARTIN	DATE: 2011-07-26	SIZE: B	SCALE(S): 1/8	SHEET: 1 OF 1
VERIFIED BY:	DATE: 2011-07-26	DRAWING NUMBER: SQN74_FA002R03		REV: 3

Tempest LMF ICD Flow Curve

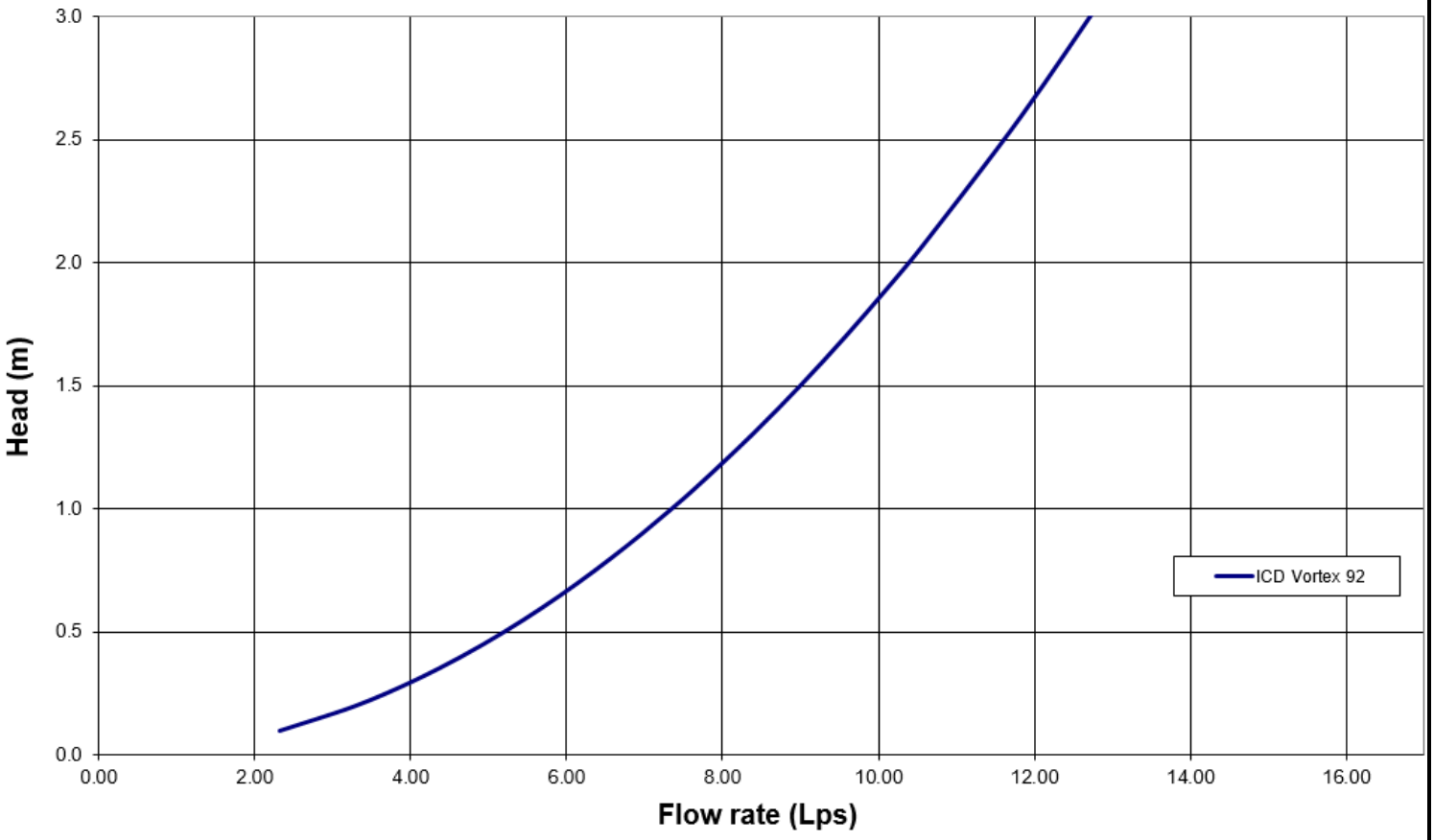
Flow: 14 L/s
Head: 2.47 m
CBMH4



IPEX

Tempest LMF ICD Flow Curve

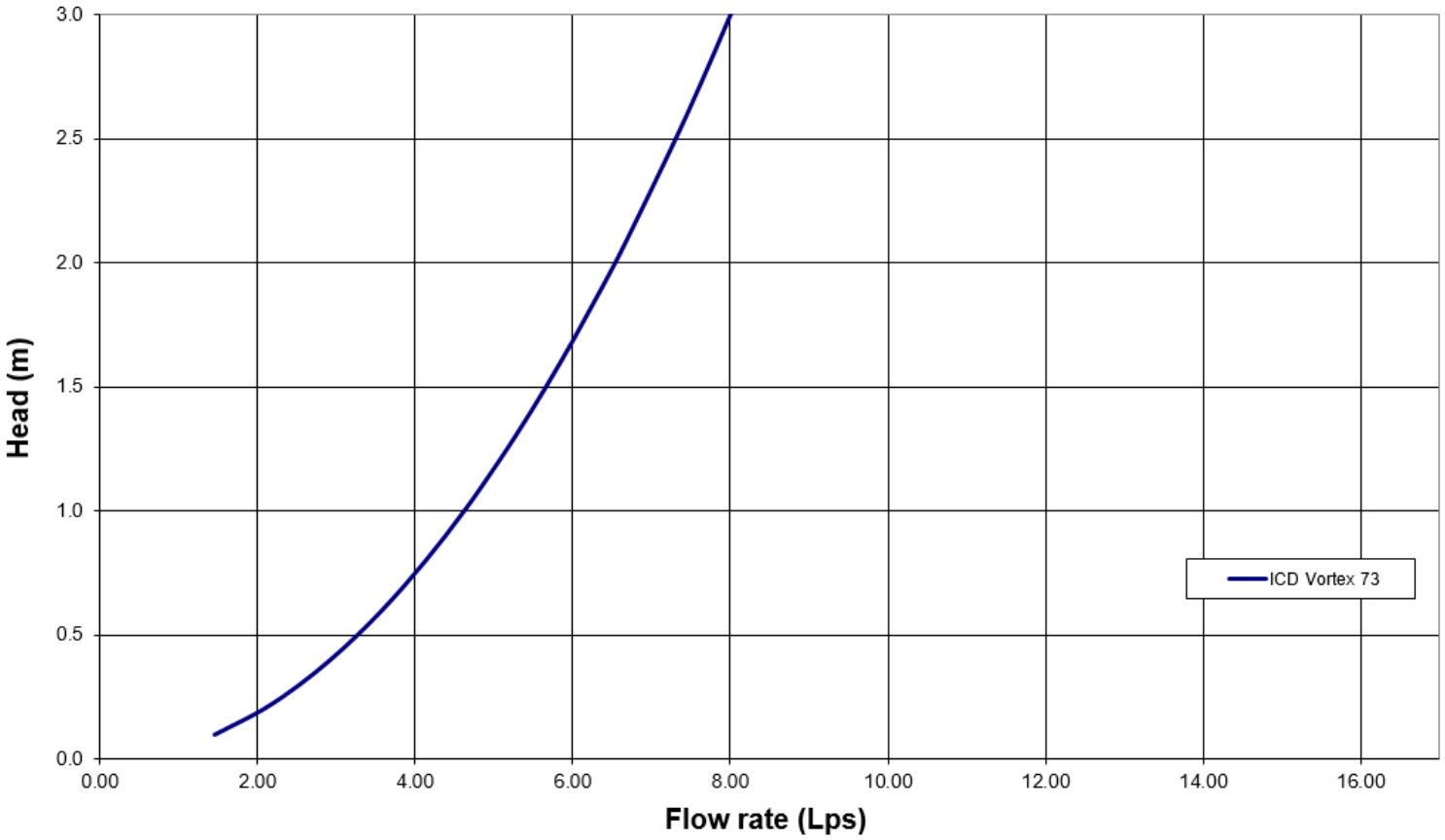
Flow: 10.9 L/s
Head: 2.21 m
CBMH8



IPEX

Tempest LMF ICD Flow Curve

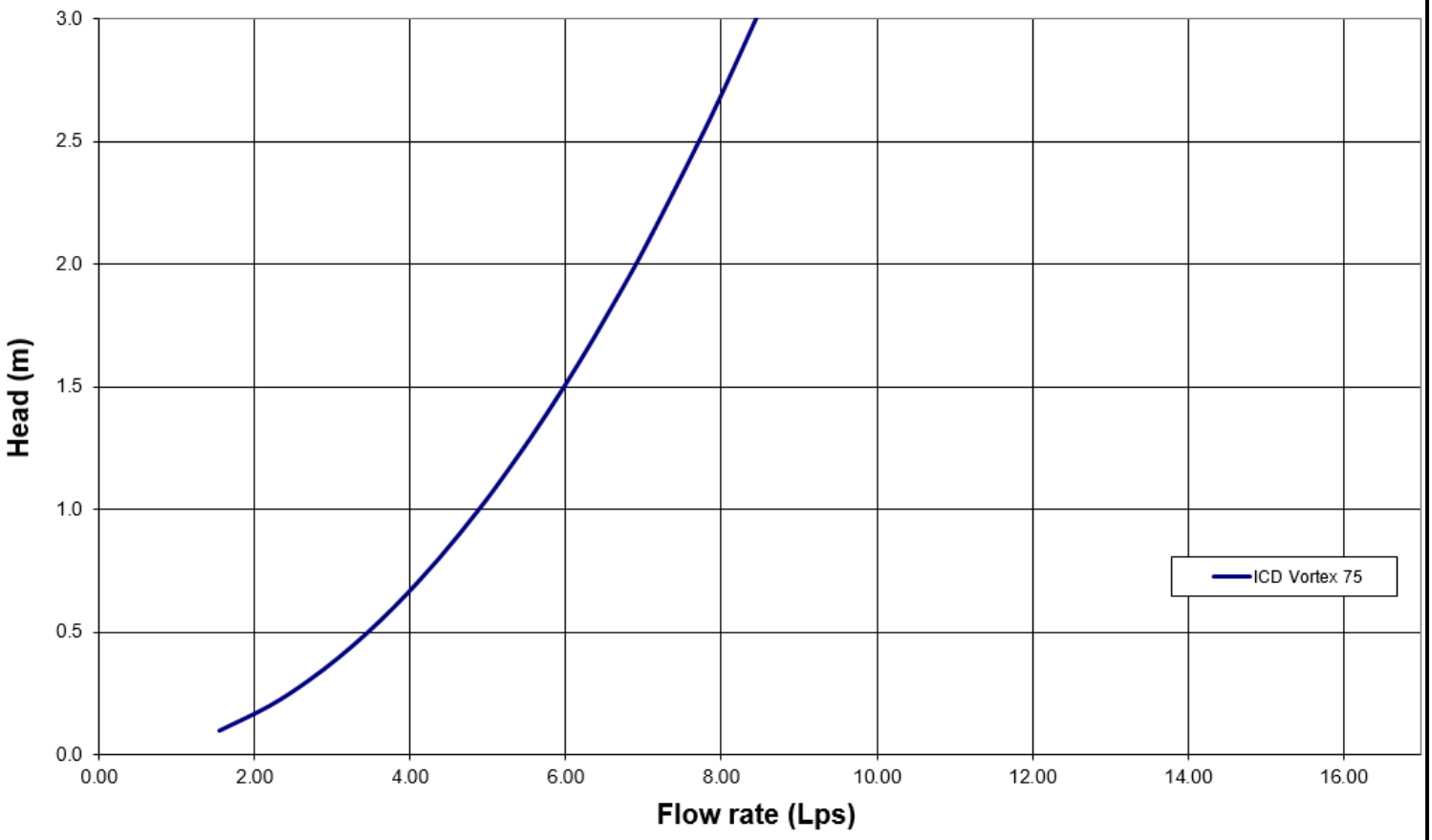
Flow: 6.9 L/s
Head: 2.29 m
CBMH12



IPEX

Tempest LMF ICD Flow Curve

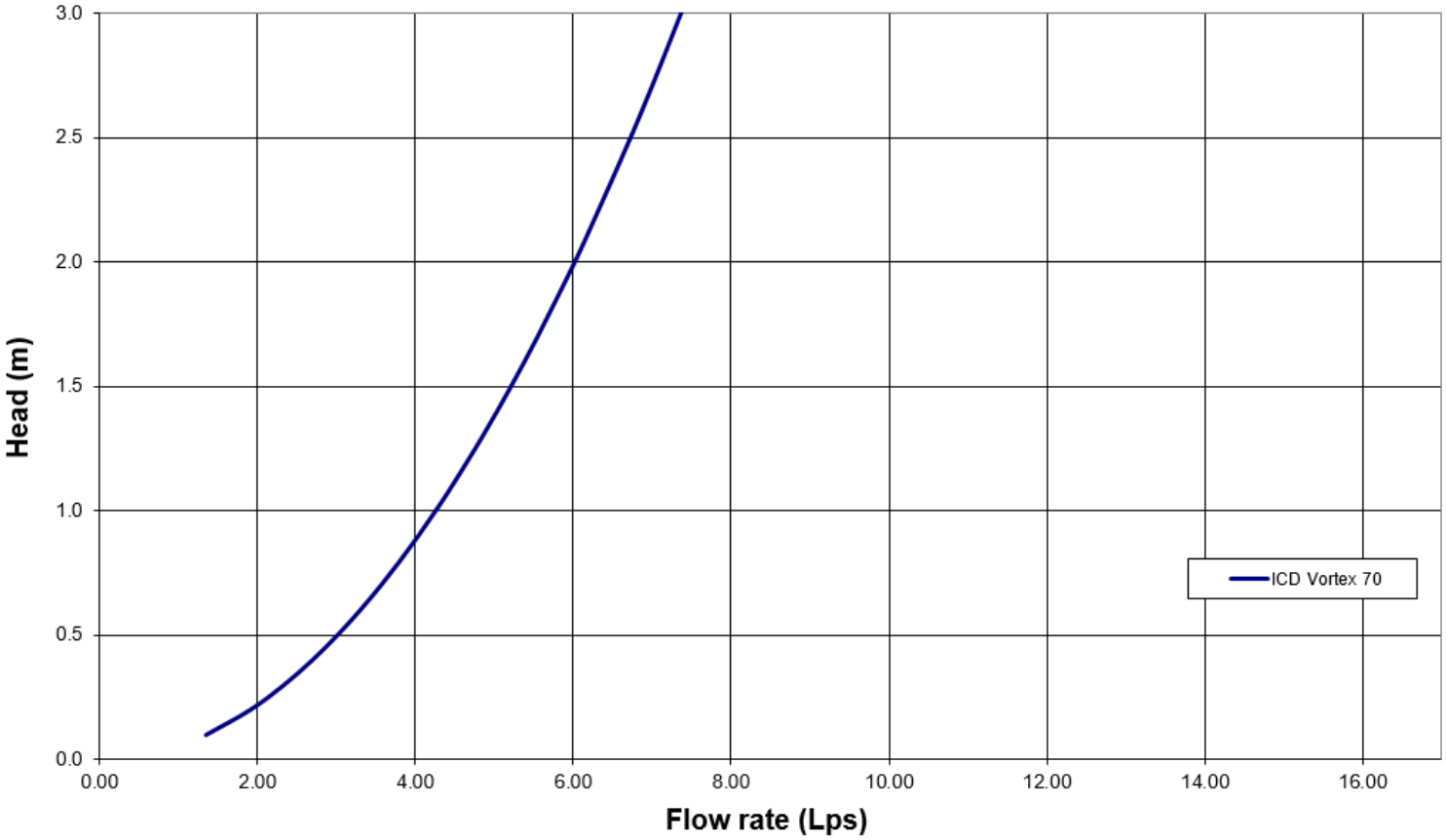
Flow: 7.4 L/s
Head: 2.28 m
CBMH13



IPEX

Tempest LMF ICD Flow Curve

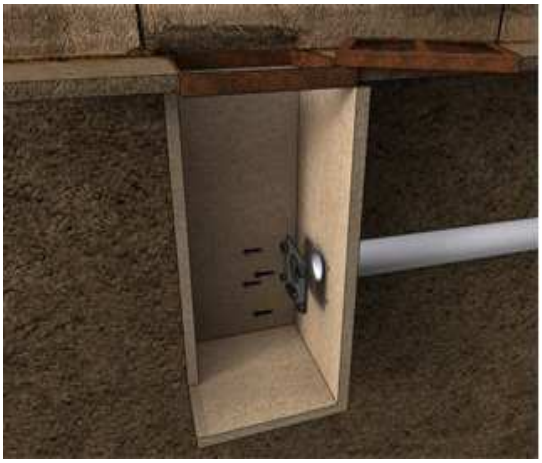
Flow: 6.6 L/s
Head: 2.37 m
CBMH14

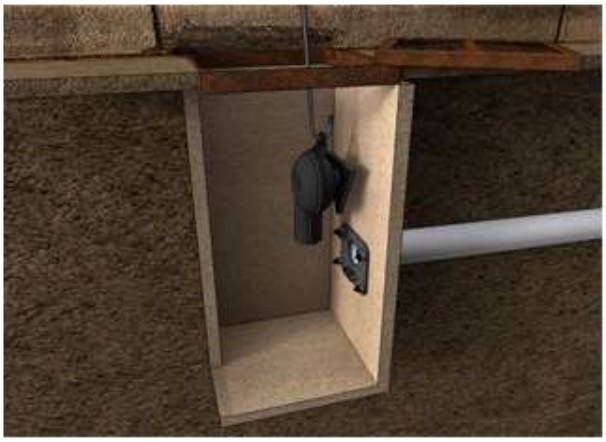


IPEX

Square CB Installation Notes:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8'' concrete bit, torque wrench for 9/16''nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8x3-1/2, (4) washers, (4) nuts
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8'' concrete bit to make the four holes at a minimum of 1-1/2'' depth up to 2-1/2''. Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.



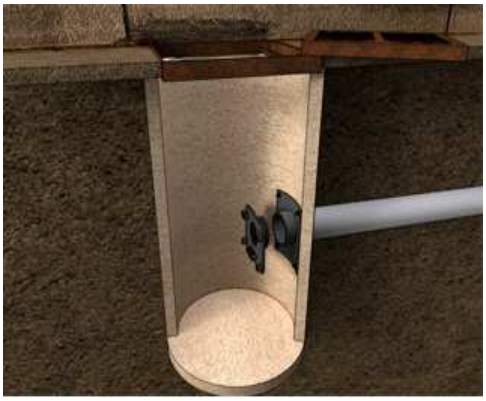


IPEX

Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. Slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered into the mounting plate and has created a seal.






CAUTION/WARNING/DISCLAIM:

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX

IPEX TEMPEST Inlet Control Devices Technical Specification

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's must have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Model Schematics

NOVATECH
Engineers, Planners & Landscape Architects

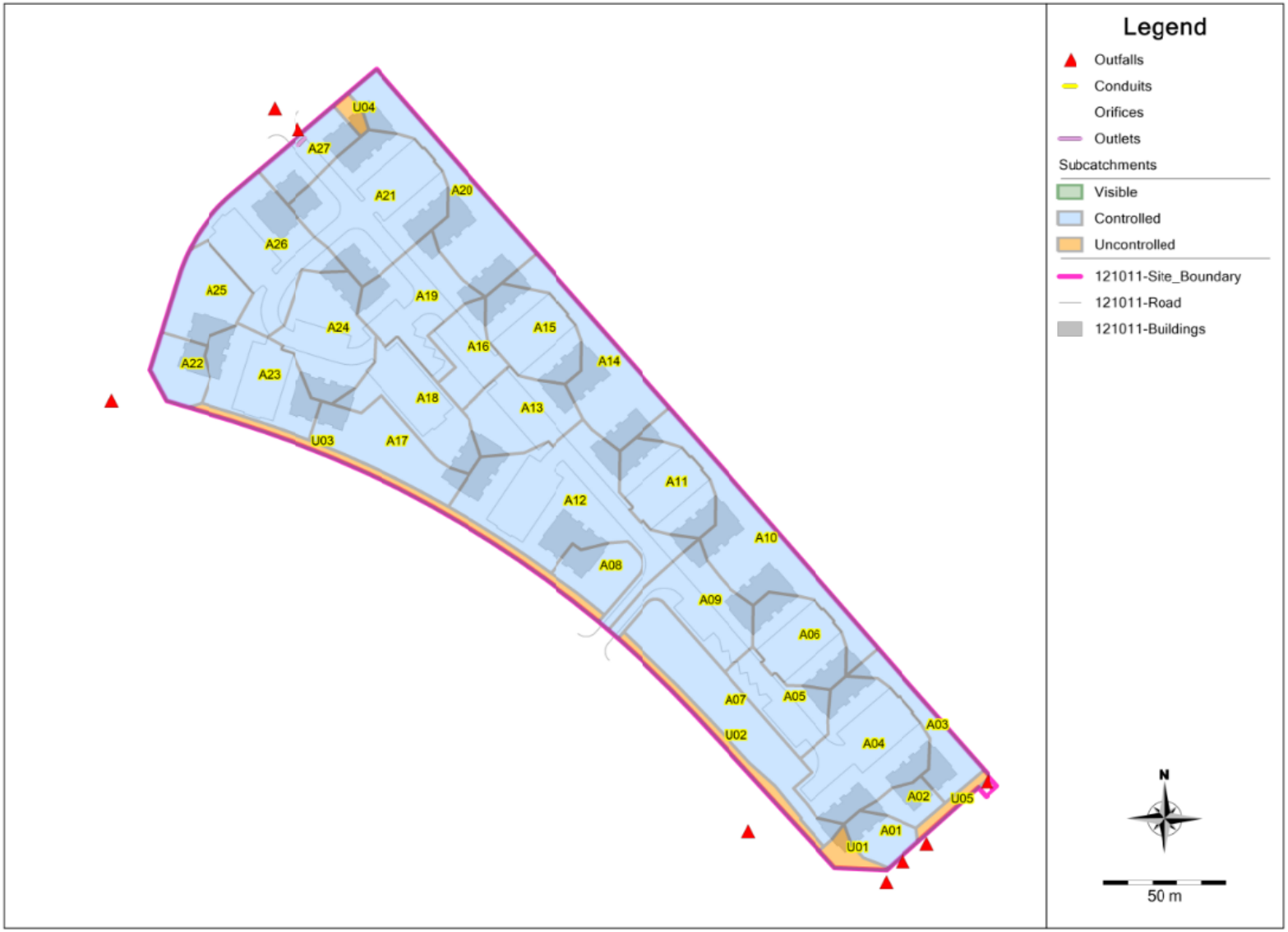
Overall Model Schematic

Date: 2021-09-29
M:\2021\121011\DATA\Calculations\Sewer Calcs\SWM\121011-PCSWMM Model Schematics.docx

Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Model Schematics

NOVATECH
Engineers, Planners & Landscape Architects

Subcatchments



Date: 2021-09-29
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Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Model Schematics

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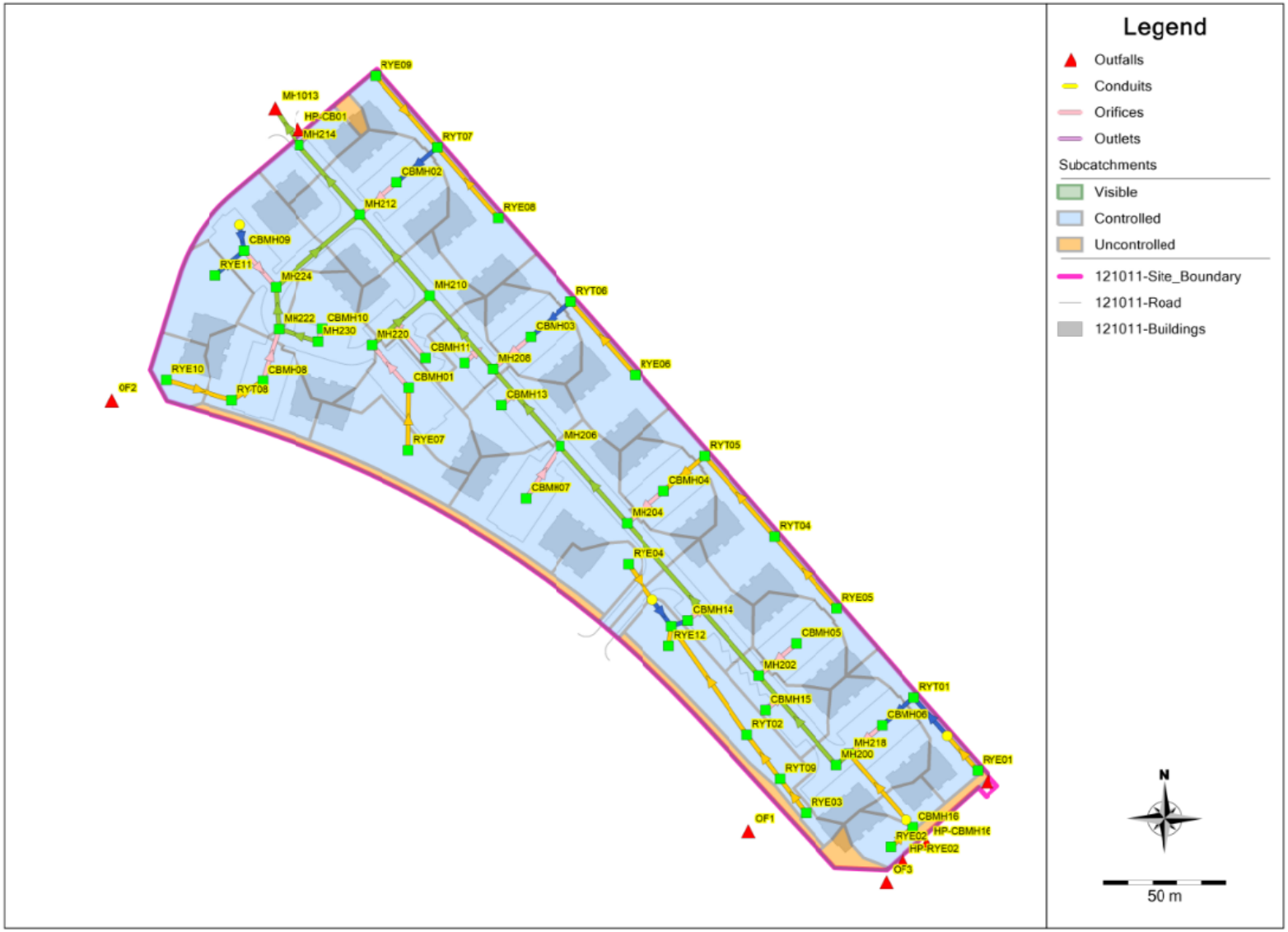
Minor System (MH IDs)



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Fernbank Zens - 5331 Fernbank Road (121011)
PCSWMM Model Schematics

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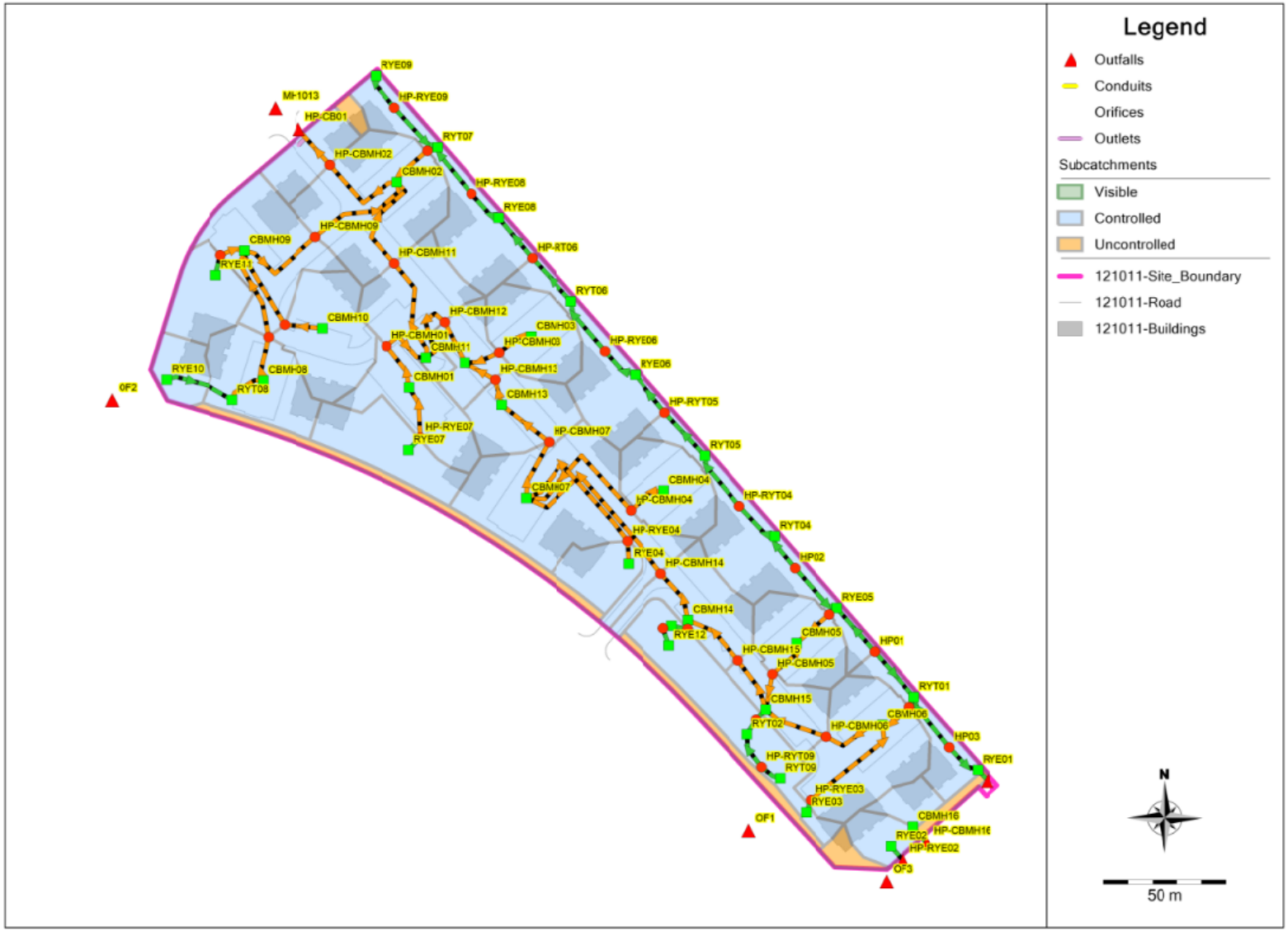
Major System (CB IDs)



Date: 2021-09-29
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Fernbank Zens – 5331 Fernbank Road (121011)
PCSWMM Model Output
100yr, 3-hour Chicago Storm

NOVATECH
Engineers, Planners & Landscape Architects

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
  ---------------------------------------------------------------

*************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 32
  Number of nodes ........... 98
  Number of links ........... 131
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                Data       Recording
  Name                 Data Source              Type       Interval
  ------------------------------------------------------------------
  RG-1                 C3hr-100YR               INTENSITY  10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                 Area     Width   %Imperv    %Slope Rain Gage           Outlet
  ------------------------------------------------------------------------------------
---
  A01                  0.04     20.00     45.70    1.5000 RG-1                RYE02
  A02                  0.04     26.67     74.30    1.5000 RG-1                CBMH16
  A03                  0.08     40.00     51.40    1.5000 RG-1                RYT01
  A04                  0.21     84.00     85.70    1.5000 RG-1                CBMH06
  A05                  0.09     36.00     82.90    1.5000 RG-1                CBMH15
  A06                  0.12     60.00     90.00    1.5000 RG-1                CBMH05
  A07                  0.18     51.43     45.70    1.5000 RG-1                RYT03
  A08                  0.07     35.00     41.40    1.5000 RG-1                RYE04
  A09                  0.13     65.00     87.10    1.5000 RG-1                CBMH14
  A10                  0.19     76.00     52.90    1.5000 RG-1                RYT05
  A11                  0.12     60.00     87.10    1.5000 RG-1                CBMH04
  A12                  0.32     80.00     80.00    1.5000 RG-1                CBMH07
  A13                  0.12     60.00     72.90    1.5000 RG-1                CBMH13
  A14                  0.15     60.00     54.30    1.5000 RG-1                RYE06
  A15                  0.12     60.00     87.10    1.5000 RG-1                CBMH03
  A16                  0.08     53.33     74.30    1.5000 RG-1                CBMH12
  A17                  0.12     34.29     24.30    1.5000 RG-1                RYE07
  A18                  0.13     43.33     81.40    1.5000 RG-1                CBMH01
  A19                  0.14     40.00     85.70    1.5000 RG-1                CBMH11
  A20                  0.17     68.00     52.90    1.5000 RG-1                RYE08
  A21                  0.25    100.00     85.70    1.5000 RG-1                CBMH02
  A22                  0.05     33.33     42.90    1.5000 RG-1                RYE10
  A23                  0.14     70.00     77.10    1.5000 RG-1                CBMH08
  A24                  0.15     75.00     70.00    1.5000 RG-1                CBMH10
  A25                  0.09     45.00     27.10    1.5000 RG-1                RYE11
  A26                  0.18     72.00     77.10    1.5000 RG-1                CBMH09
  A27                  0.07     35.00     71.40    1.5000 RG-1                CB01
  U01                  0.02     40.00     30.00    1.5000 RG-1                OF3
  U02                  0.04     80.00      0.00   33.3300 RG-1                OF1
  U03                  0.06    120.00      0.00   33.3300 RG-1                OF2
  U04                  0.01      6.67     84.30    1.5000 RG-1                OF2
  U05                  0.02     40.00      8.60    1.5000 RG-1                OF3


  ************
  Node Summary
  ************
                                      Invert      Max.    Ponded    External
  Name                 Type            Elev.     Depth      Area    Inflow
  ------------------------------------------------------------------------
  CB01                 JUNCTION        96.88      1.00       0.0
  CBMH09-Dummy         JUNCTION        94.85      3.15       0.0
  CBMH16-Dummy         JUNCTION        95.50      1.95       0.0
  HP01                 JUNCTION        97.70      1.00       0.0
  HP02                 JUNCTION        97.70      1.00       0.0
  HP03                 JUNCTION        97.70      1.00       0.0
  HP-CBMH01            JUNCTION        97.15      1.00       0.0
  HP-CBMH02            JUNCTION        97.00      1.00       0.0
  HP-CBMH03            JUNCTION        97.15      1.00       0.0
  HP-CBMH04            JUNCTION        97.45      1.00       0.0
  HP-CBMH05            JUNCTION        97.60      1.00       0.0
  HP-CBMH06            JUNCTION        97.65      1.00       0.0
  HP-CBMH07            JUNCTION        97.25      1.00       0.0
  HP-CBMH08            JUNCTION        97.15      1.00       0.0
  HP-CBMH09            JUNCTION        97.10      1.00       0.0
  HP-CBMH10            JUNCTION        97.15      1.00       0.0
  HP-CBMH11            JUNCTION        97.10      1.00       0.0
  HP-CBMH12            JUNCTION        97.13      1.00       0.0
  HP-CBMH13            JUNCTION        96.96      1.00       0.0
  HP-CBMH14            JUNCTION        97.55      1.00       0.0
  HP-CBMH15            JUNCTION        97.60      1.00       0.0
  HP-RT06              JUNCTION        97.20      1.00       0.0
  HP-RYE03             JUNCTION        97.95      1.00       0.0
  HP-RYE04             JUNCTION        97.60      1.00       0.0
  HP-RYE05             JUNCTION        97.60      1.00       0.0
  HP-RYE06             JUNCTION        97.30      1.00       0.0
  HP-RYE07             JUNCTION        97.20      1.00       0.0
  HP-RYE08             JUNCTION        97.07      1.00       0.0
  HP-RYE09             JUNCTION        97.10      1.00       0.0
  HP-RYE11             JUNCTION        97.10      1.00       0.0
  HP-RYE12             JUNCTION        97.45      1.00       0.0
  HP-RYT01             JUNCTION        97.65      1.00       0.0
  HP-RYT02             JUNCTION        97.48      1.00       0.0
  HP-RYT03             JUNCTION        97.40      1.00       0.0
  HP-RYT04             JUNCTION        97.45      1.00       0.0
  HP-RYT05             JUNCTION        97.40      1.00       0.0
  HP-RYT07             JUNCTION        97.05      1.03       0.0
  HP-RYT09             JUNCTION        97.70      1.00       0.0
  RYT01-Dummy          JUNCTION        95.38      3.26       0.0
  RYT03-Dummy          JUNCTION        95.30      2.40       0.0
  HP-CB01              OUTFALL         96.85      1.00       0.0
  HP-CBMH16            OUTFALL         97.50      1.00       0.0
  HP-RYE01             OUTFALL         97.60      1.00       0.0
  HP-RYE02             OUTFALL         97.35      1.00       0.0
  MH1013               OUTFALL         94.08      0.82       0.0
  OF1                  OUTFALL         97.40      0.00       0.0
  OF2                  OUTFALL         98.20      0.00       0.0
  OF3                  OUTFALL         97.40      0.00       0.0
  CBMH01               STORAGE         94.86      2.99       0.0
  CBMH02               STORAGE         94.64      3.06       0.0
  CBMH03               STORAGE         94.83      3.02       0.0
  CBMH04               STORAGE         94.98      3.17       0.0
  CBMH05               STORAGE         95.23      3.07       0.0
  CBMH06               STORAGE         95.34      3.01       0.0
  CBMH07               STORAGE         94.92      3.03       0.0
  CBMH08               STORAGE         94.95      2.90       0.0
  CBMH09               STORAGE         94.83      2.97       0.0
  CBMH10               STORAGE         95.02      2.83       0.0
  CBMH11               STORAGE         95.21      2.59       0.0
  CBMH12               STORAGE         94.81      3.02       0.0
  CBMH13               STORAGE         94.82      3.01       0.0
  CBMH14               STORAGE         95.18      3.07       0.0
  CBMH15               STORAGE         95.60      2.70       0.0
  CBMH16               STORAGE         95.50      2.95       0.0
  MH200                STORAGE         95.12      2.48       0.0
  MH202                STORAGE         94.93      2.64       0.0
  MH204                STORAGE         94.69      2.73       0.0
  MH206                STORAGE         94.53      2.73       0.0
  MH208                STORAGE         94.39      2.64       0.0
  MH210                STORAGE         94.26      2.83       0.0
  MH212                STORAGE         94.14      2.80       0.0
  MH214                STORAGE         94.10      2.81       0.0
  MH218                STORAGE         95.20      2.34       0.0
  MH220                STORAGE         94.71      2.45       0.0
  MH222                STORAGE         94.73      2.39       0.0
  MH224                STORAGE         94.61      2.36       0.0
  MH230                STORAGE         94.93      2.10       0.0
  RYE01                STORAGE         95.48      2.97       0.0
  RYE02                STORAGE         95.62      2.58       0.0
  RYE03                STORAGE         95.78      2.92       0.0
  RYE04                STORAGE         95.37      2.93       0.0
  RYE05                STORAGE         95.62      2.73       0.0
  RYE06                STORAGE         95.45      2.60       0.0
  RYE07                STORAGE         95.02      2.83       0.0
  RYE08                STORAGE         95.25      2.60       0.0
  RYE09                STORAGE         95.25      2.60       0.0
  RYE10                STORAGE         95.68      2.32       0.0
  RYE11                STORAGE         94.86      2.94       0.0
  RYE12                STORAGE         95.55      2.70       0.0
  RYT01                STORAGE         95.36      2.94       0.0
  RYT02                STORAGE         95.53      2.72       0.0
  RYT03                STORAGE         95.22      3.03       0.0
  RYT04                STORAGE         95.42      2.73       0.0
  RYT05                STORAGE         95.14      2.91       0.0
  RYT06                STORAGE         94.86      2.99       0.0
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RYT07	STORAGE	94.67	3.03	0.0
RYT08	STORAGE	95.16	3.04	0.0
RYT09	STORAGE	95.70	2.85	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
CBMH16-MH218	CBMH16-Dummy	MH218	CONDUIT	39.6	0.4546	0.0130
Dummy-CBMH09	CBMH09-Dummy	CBMH09	CONDUIT	14.0	0.1429	0.0130
MH200-MH202	MH200	MH202	CONDUIT	48.0	0.2500	0.0130
MH202-MH204	MH202	MH204	CONDUIT	81.9	0.2076	0.0130
MH204-MH206	MH204	MH206	CONDUIT	41.5	0.2169	0.0130
MH206-MH208	MH206	MH208	CONDUIT	41.4	0.1691	0.0130
MH208-MH210	MH208	MH210	CONDUIT	39.4	0.1523	0.0130
MH210-MH212	MH210	MH212	CONDUIT	43.5	0.1149	0.0130
MH212-MH214	MH212	MH214	CONDUIT	37.4	0.1070	0.0130
MH214-MH1013	MH214	MH1013	CONDUIT	18.0	0.1111	0.0130
MH218-MH200	MH218	MH200	CONDUIT	7.1	0.2817	0.0130
MH220-MH210	MH220	MH210	CONDUIT	30.9	0.2589	0.0130
MH222-MH224	MH222	MH224	CONDUIT	17.1	0.2924	0.0130
MH224-MH212	MH224	MH212	CONDUIT	44.9	0.2004	0.0130
MH230-MH222	MH230	MH222	CONDUIT	17.0	0.4706	0.0130
MS-CB01	CB01	HP-CB01	CONDUIT	3.0	1.0001	0.0150
MS-CBMH01(1)	CBMH01	HP-CBMH01	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH01(2)	HP-CBMH01	CBMH11	CONDUIT	3.0	11.7469	0.0150
MS-CBMH02(1)	CBMH02	HP-CBMH02	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH02(2)	HP-CBMH02	CB01	CONDUIT	3.0	4.0032	0.0150
MS-CBMH03(1)	CBMH03	HP-CBMH03	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH03(2)	HP-CBMH03	CBMH12	CONDUIT	3.0	10.7279	0.0150
MS-CBMH04(1)	CBMH04	HP-CBMH04	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH04(2)	HP-CBMH04	CBMH07	CONDUIT	3.0	16.9031	0.0150
MS-CBMH05(1)	CBMH05	HP-CBMH05	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH05(2)	HP-CBMH05	CBMH15	CONDUIT	3.0	10.0504	0.0150
MS-CBMH06(1)	CBMH06	HP-CBMH06	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH06(2)	HP-CBMH06	CBMH15	CONDUIT	3.0	11.7469	0.0150
MS-CBMH07(1)	CBMH07	HP-CBMH07	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH07(2)	HP-CBMH07	CBMH13	CONDUIT	3.0	14.1393	0.0150
MS-CBMH08(1)	CBMH08	HP-CBMH08	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH08(2)	HP-CBMH08	CBMH09	CONDUIT	3.0	11.7469	0.0150
MS-CBMH09(1)	CBMH09	HP-CBMH09	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH09(2)	HP-CBMH09	CBMH02	CONDUIT	3.0	13.4535	0.0150
MS-CBMH10(1)	CBMH10	HP-CBMH10	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH10(2)	HP-CBMH10	CBMH09	CONDUIT	3.0	11.7469	0.0150
MS-CBMH11(1)	CBMH11	HP-CBMH11	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH11(2)	HP-CBMH11	CBMH02	CONDUIT	3.0	13.4535	0.0150
MS-CBMH12(1)	CBMH12	HP-CBMH12	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH12(2)	HP-CBMH12	CBMH11	CONDUIT	3.0	11.0672	0.0150
MS-CBMH13(1)	CBMH13	HP-CBMH13	CONDUIT	3.0	-4.3374	0.0150
MS-CBMH13(2)	HP-CBMH13	CBMH12	CONDUIT	3.0	4.3374	0.0150
MS-CBMH14(1)	CBMH14	HP-CBMH14	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH14(2)	HP-CBMH14	CBMH07	CONDUIT	3.0	20.4124	0.0150
MS-CBMH15(1)	CBMH15	HP-CBMH15	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH15(2)	HP-CBMH15	CBMH14	CONDUIT	3.0	11.7469	0.0150
MS-CBMH16	CBMH16	HP-CBMH16	CONDUIT	8.7	-0.5758	0.0350
MS-HP01(1)	HP01	RYT01	CONDUIT	24.5	1.6322	0.0350
MS-HP01(2)	HP01	RYE05	CONDUIT	23.5	1.4905	0.0100
MS-HP02(1)	HP02	RYT04	CONDUIT	15.9	3.4695	0.0350
MS-HP02(2)	HP02	RYE05	CONDUIT	24.1	1.4541	0.0350
MS-HP03	HP03	RYT01	CONDUIT	25.1	1.5960	0.0350
MS-RYE01	RYE01	HP-RYE01	CONDUIT	7.7	-1.9373	0.0350
MS-RYE02	RYE02	HP-RYE02	CONDUIT	7.8	-1.9254	0.0350
MS-RYE03(1)	RYE03	HP-RYE03	CONDUIT	3.0	-8.3624	0.0350
MS-RYE03(2)	HP-RYE03	CBMH06	CONDUIT	3.0	20.4124	0.0150
MS-RYE04(1)	RYE04	HP-RYE04	CONDUIT	3.0	-10.0504	0.0150
MS-RYE04(2)	HP-RYE04	CBMH07	CONDUIT	62.3	1.0432	0.0150
MS-RYE05(1)	RYE05	HP-RYE05	CONDUIT	4.0	-6.2434	0.0350
MS-RYE05(2)	HP-RYE05	CBMH05	CONDUIT	3.0	10.0504	0.0150
MS-RYE06(1)	RYE06	HP-RYE06	CONDUIT	16.1	-1.5572	0.0350
MS-RYE06(2)	HP-RYE06	RYT06	CONDUIT	24.9	1.8043	0.0350
MS-RYE07(1)	RYE07	HP-RYE07	CONDUIT	3.0	-11.7469	0.0350
MS-RYE07(2)	HP-RYE07	CBMH01	CONDUIT	3.0	11.7469	0.0150
MS-RYE08(1)	RYE08	HP-RYE08	CONDUIT	15.0	-1.4668	0.0350
MS-RYE08(2)	HP-RYE08	RYT07	CONDUIT	23.6	1.5671	0.0350
MS-RYE09(1)	RYE09	HP-RYE09	CONDUIT	15.0	-1.6669	0.0350
MS-RYE09(2)	HP-RYE09	RYT07	CONDUIT	24.0	1.6669	0.0350
MS-RYE10(1)	RYE10	RYT08	CONDUIT	29.1	-0.6877	0.0350
MS-RYE10(2)	RYT08	CBMH08	CONDUIT	3.0	11.7469	0.0150
MS-RYE11(1)	RYE11	HP-RYE11	CONDUIT	8.4	-3.5870	0.0350
MS-RYE11(2)	HP-RYE11	CBMH09	CONDUIT	3.0	10.0504	0.0150
MS-RYE12(1)	RYE12	HP-RYE12	CONDUIT	3.0	-6.6815	0.0350
MS-RYE12(2)	HP-RYE12	RYT03	CONDUIT	3.0	6.6815	0.0350
MS-RYT01(1)	RYT01	HP-RYT01	CONDUIT	4.4	-7.9798	0.0350
MS-RYT01(2)	HP-RYT01	CBMH06	CONDUIT	3.0	10.0504	0.0150
MS-RYT01(3)	HP03	RYE01	CONDUIT	15.2	1.6481	0.0350
MS-RYT02(1)	RYT02	HP-RYT02	CONDUIT	3.0	-7.6893	0.0350
MS-RYT02(2)	HP-RYT02	CBMH15	CONDUIT	3.0	6.0108	0.0350
MS-RYT03(1)	RYT03	HP-RYT03	CONDUIT	3.0	-5.0063	0.0350
MS-RYT03(2)	HP-RYT03	CBMH14	CONDUIT	3.0	5.0063	0.0350
MS-RYT04(1)	RYT04	HP-RYT04	CONDUIT	19.4	-1.5438	0.0350
MS-RYT04(2)	HP-RYT04	RYT05	CONDUIT	25.4	1.5726	0.0350
MS-RYT05(1)	RYT05	HP-RYT05	CONDUIT	23.9	-1.4675	0.0350
MS-RYT05(2)	HP-RYT05	RYE06	CONDUIT	19.6	1.7830	0.0350
MS-RYT06(1)	RYT06	HP-RT06	CONDUIT	23.9	-1.4674	0.0350
MS-RYT06(2)	HP-RT06	RYE08	CONDUIT	21.2	1.6489	0.0350
MS-RYT07(1)	RYT07	HP-RYT07	CONDUIT	4.4	-8.0036	0.0350
MS-RYT07(2)	HP-RYT07	CBMH02	CONDUIT	3.0	11.7469	0.0150
MS-RYT09(1)	RYT09	HP-RYT09	CONDUIT	3.0	-5.0063	0.0350
MS-RYT09(2)	HP-RYT09	RYT02	CONDUIT	3.0	15.1717	0.0350
RYE01-RYT01-Dummy	RYE01	RYT01-Dummy	CONDUIT	17.0	0.5294	0.0130
RYE02-CBMH16	RYE02	CBMH16	CONDUIT	12.1	0.4959	0.0130
RYE03-RYT09	RYE03	RYT09	CONDUIT	16.5	0.4849	0.0130
RYE04-RYT03(1)	RYE04	RYT03-Dummy	CONDUIT	15.0	0.4667	0.0130
RYE04-RYT03(2)	RYT03-Dummy	RYT03	CONDUIT	15.9	0.1258	0.0130
RYE05-RYT04	RYE05	RYT04	CONDUIT	38.6	0.5181	0.0130
RYE06-RYT06	RYE06	RYT06	CONDUIT	39.4	0.5076	0.0130
RYE07-CBMH01	RYE07	CBMH01	CONDUIT	25.4	0.5118	0.0130
RYE08-RYT07	RYE08	RYT07	CONDUIT	37.9	0.5013	0.0130
RYE09-RYT02	RYT09	RYT02	CONDUIT	32.5	0.5231	0.0130
RYE09-RYT07	RYE09	RYT07	CONDUIT	38.4	0.4948	0.0130
RYE10-RYT08	RYE10	RYT08	CONDUIT	28.0	0.5000	0.0130
RYE11-CBMH09	RYE11	CBMH09	CONDUIT	14.3	0.2098	0.0130
RYE12-RYT03	RYE12	RYT03	CONDUIT	11.6	0.5172	0.0130
RYT01-CBMH06	RYT01	CBMH06	CONDUIT	16.5	0.1212	0.0130
RYT01-Dummy-RYT01	RYT01-Dummy	RYT01	CONDUIT	22.1	0.0905	0.0130
RYT02-RYT03	RYT02	RYT03	CONDUIT	43.6	0.5046	0.0130
RYT03-CBMH14	RYT03	CBMH14	CONDUIT	6.9	0.1449	0.0130
RYT04-RYT05	RYT04	RYT05	CONDUIT	43.3	0.5081	0.0130
RYT05-CBMH04	RYT05	CBMH04	CONDUIT	21.8	0.5046	0.0130
RYT06-CBMH03	RYT06	CBMH03	CONDUIT	20.8	0.1442	0.0130
RYT07-CBMH02	RYT07	CBMH02	CONDUIT	20.8	0.1442	0.0130
RYT08-CBMH08	RYT08	CBMH08	CONDUIT	14.8	1.0136	0.0130
O-CBMH01	CBMH01	MH220	ORIFICE			
O-CBMH02	CBMH02	MH212	ORIFICE			
O-CBMH03	CBMH03	MH208	ORIFICE			
O-CBMH04	CBMH04	MH204	ORIFICE			
O-CBMH05	CBMH05	MH202	ORIFICE			
O-CBMH06	CBMH06	MH218	ORIFICE			
O-CBMH07	CBMH07	MH206	ORIFICE			
O-CBMH08	CBMH08	MH222	ORIFICE			
O-CBMH09	CBMH09	MH224	ORIFICE			
O-CBMH10	CBMH10	MH230	ORIFICE			
O-CBMH11	CBMH11	MH220	ORIFICE			
O-CBMH12	CBMH12	MH208	ORIFICE			
O-CBMH13	CBMH13	MH206	ORIFICE			
O-CBMH14	CBMH14	MH202	ORIFICE			
O-CBMH15	CBMH15	MH200	ORIFICE			
O-CBMH16	CBMH16	CBMH16-Dummy	ORIFICE			
O-CB01	CB01	MH214	OUTLET			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
CBMH16-MH218	CIRCULAR	0.25	0.05	0.06	0.25	1	40.10
Dummy-CBMH09	CIRCULAR	0.60	0.28	0.15	0.60	1	232.09
MH200-MH202	CIRCULAR	0.38	0.11	0.09	0.38	1	87.67
MH202-MH204	CIRCULAR	0.45	0.16	0.11	0.45	1	129.90
MH204-MH206	CIRCULAR	0.53	0.22	0.13	0.53	1	200.29
MH206-MH208	CIRCULAR	0.60	0.28	0.15	0.60	1	252.49
MH208-MH210	CIRCULAR	0.68	0.36	0.17	0.68	1	328.05
MH210-MH212	CIRCULAR	0.75	0.44	0.19	0.75	1	377.46
MH212-MH214	CIRCULAR	0.82	0.53	0.21	0.82	1	469.47
MH214-MH1013	CIRCULAR	0.82	0.53	0.21	0.82	1	478.51
MH218-MH200	CIRCULAR	0.38	0.11	0.09	0.38	1	93.06
MH220-MH210	CIRCULAR	0.38	0.11	0.09	0.38	1	89.22
MH222-MH224	CIRCULAR	0.38	0.11	0.09	0.38	1	94.81
MH224-MH212	CIRCULAR	0.45	0.16	0.11	0.45	1	127.65
MH230-MH222	CIRCULAR	0.25	0.05	0.06	0.25	1	40.80

MS-CB01	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
MS-CBMH01(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH01(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH02(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH02(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	28468.25
MS-CBMH03(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH03(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	46602.99
MS-CBMH04(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH04(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	58497.86
MS-CBMH05(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH05(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH06(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH06(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH07(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH07(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	53502.02
MS-CBMH08(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH08(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH09(1)	CIRCULAR	1.00	0.79	0.25	1.00	1	6587.83
MS-CBMH09(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
MS-CBMH10(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH10(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH11(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH11(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
MS-CBMH12(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH12(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	47334.20
MS-CBMH13(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
MS-CBMH13(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
MS-CBMH14(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH14(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	64284.19
MS-CBMH15(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH15(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH16	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	4496.13
MS-HP01(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7570.03
MS-HP01(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	25319.22
MS-HP02(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	11036.80
MS-HP02(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7145.00
MS-HP03	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7485.58
MS-RYE01	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	8247.34
MS-RYE02	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	8221.89
MS-RYE03(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	17134.69
MS-RYE03(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	64284.19
MS-RYE04(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYE04(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	14532.59
MS-RYE05(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	14805.47
MS-RYE05(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYE06(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7394.14
MS-RYE06(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7959.03
MS-RYE07(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	20308.20
MS-RYE07(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-RYE08(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7176.28
MS-RYE08(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7417.58
MS-RYE09(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7650.06
MS-RYE09(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7650.06
MS-RYE10(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	4913.64
MS-RYE10(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-RYE11(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	11222.09
MS-RYE11(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYE12(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	15316.10
MS-RYE12(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	15316.10
MS-RYT01(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	16738.13
MS-RYT01(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYT01(3)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7606.81
MS-RYT02(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	16430.60
MS-RYT02(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	14527.05
MS-RYT03(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	13257.66
MS-RYT03(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	13257.66
MS-RYT04(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7362.15
MS-RYT04(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7430.48
MS-RYT05(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7177.88
MS-RYT05(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7911.98
MS-RYT06(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7177.58
MS-RYT06(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7608.67
MS-RYT07(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	16763.07
MS-RYT07(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-RYT09(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	13257.66
MS-RYT09(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	23079.51
RYE01-RYT01-Dummy	CIRCULAR	0.25	0.05	0.06	0.25	1	43.27
RYE02-CBMH16	CIRCULAR	0.25	0.05	0.06	0.25	1	41.88
RYE03-RYT09	CIRCULAR	0.25	0.05	0.06	0.25	1	41.41
RYE04-RYT03(1)	CIRCULAR	0.25	0.05	0.06	0.25	1	40.63
RYE04-RYT03(2)	CIRCULAR	0.60	0.28	0.15	0.60	1	217.78
RYE05-RYT04	CIRCULAR	0.25	0.05	0.06	0.25	1	42.81
RYE06-RYT06	CIRCULAR	0.25	0.05	0.06	0.25	1	42.37
RYE07-CBMH01	CIRCULAR	0.25	0.05	0.06	0.25	1	42.55
RYE08-RYT07	CIRCULAR	0.25	0.05	0.06	0.25	1	42.11
RYE09-RYT02	CIRCULAR	0.25	0.05	0.06	0.25	1	43.01
RYE09-RYT07	CIRCULAR	0.25	0.05	0.06	0.25	1	41.83
RYE10-RYT08	CIRCULAR	0.25	0.05	0.06	0.25	1	42.05
RYE11-CBMH09	CIRCULAR	0.60	0.28	0.15	0.60	1	281.25
RYE12-RYT03	CIRCULAR	0.25	0.05	0.06	0.25	1	42.77
RYT01-CBMH06	CIRCULAR	0.60	0.28	0.15	0.60	1	213.78
RYT01-Dummy-RYT01	CIRCULAR	0.60	0.28	0.15	0.60	1	184.72
RYT02-RYT03	CIRCULAR	0.25	0.05	0.06	0.25	1	42.25
RYT03-CBMH14	CIRCULAR	0.60	0.28	0.15	0.60	1	233.76
RYT04-RYT05	CIRCULAR	0.25	0.05	0.06	0.25	1	42.39
RYT05-CBMH04	CIRCULAR	0.25	0.05	0.06	0.25	1	42.25
RYT06-CBMH03	CIRCULAR	0.60	0.28	0.15	0.60	1	233.20
RYT07-CBMH02	CIRCULAR	0.75	0.44	0.19	0.75	1	422.82
RYT08-CBMH08	CIRCULAR	0.25	0.05	0.06	0.25	1	59.87

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

```
***************
Analysis Options
***************
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 05/19/2021 00:00:00
Ending Date ..... 05/20/2021 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 4
Head Tolerance ..... 0.001524 m
```

**********	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**********	---------	-------
Total Precipitation	0.265	71.667
Evaporation Loss	0.000	0.000
Infiltration Loss	0.054	14.579
Surface Runoff	0.212	57.230
Final Storage	0.002	0.659
Continuity Error (%)	-1.119	

**********	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.212	2.116
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.004
External Outflow	0.212	2.118
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.012	0.120
Final Stored Volume	0.012	0.121
Continuity Error (%)	0.060	

```
**************************
Highest Continuity Errors
**************************
Node RYT01-Dummy (-2.59%)


**************************
Time-Step Critical Elements
**************************
Link MH208-MH210 (5.72%)
Link MS-RYT02(2) (4.90%)
Link MS-CBMH13(1) (4.44%)
Link RYT03-CBMH14 (2.66%)
Link MS-CBMH03(1) (1.32%)


*********************************
Highest Flow Instability Indexes
*********************************
Link O-CBMH10 (92)
Link O-CBMH01 (78)
Link O-CBMH09 (43)
Link O-CBMH03 (25)
Link O-CBMH07 (24)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.56 sec
Average Time Step           :     4.47 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.18
Percent Not Converging      :     0.05
Time Step Frequencies       :
    5.000 -  3.155 sec      :    82.91 %
    3.155 -  1.991 sec      :     9.54 %
    1.991 -  1.256 sec      :     7.26 %
    1.256 -  0.792 sec      :     0.20 %
    0.792 -  0.500 sec      :     0.08 %


****************************
Subcatchment Runoff Summary
****************************

-----------------------------------------------------------------------------------------------------------------------
                          Total      Total      Total      Total     Imperv       Perv      Total      Total      Peak  Runoff
                         Precip      Runon       Evap      Infil    Runoff     Runoff     Runoff     Runoff    Runoff   Coeff
  Subcatchment             mm         mm         mm         mm         mm         mm         mm     10^6 ltr       LPS
-----------------------------------------------------------------------------------------------------------------------
  A01                     71.67       0.00       0.00      24.34      32.59      15.30      47.89       0.02     15.94   0.668
  A02                     71.67       0.00       0.00      11.32      53.01       7.78      60.78       0.02     18.91   0.848
  A03                     71.67       0.00       0.00      21.73      36.66      13.80      50.47       0.04     33.23   0.704
  A04                     71.67       0.00       0.00       6.30      60.54       4.35      64.89       0.14    101.54   0.905
  A05                     71.67       0.00       0.00       7.54      58.62       5.14      63.76       0.06     43.18   0.890
  A06                     71.67       0.00       0.00       4.38      63.60       3.15      66.76       0.08     58.62   0.931
  A07                     71.67       0.00       0.00      24.79      32.17      14.59      46.77       0.08     64.29   0.653
  A08                     71.67       0.00       0.00      26.32      29.52      16.41      45.93       0.03     26.95   0.641
  A09                     71.67       0.00       0.00       5.66      61.54       4.01      65.55       0.09     63.16   0.915
  A10                     71.67       0.00       0.00      21.16      37.84      13.19      51.03       0.10     77.24   0.712
  A11                     71.67       0.00       0.00       5.66      61.82       4.01      65.82       0.08     58.30   0.918
  A12                     71.67       0.00       0.00       8.90      56.93       5.76      62.69       0.20    149.48   0.875
  A13                     71.67       0.00       0.00      11.99      51.71       8.01      59.72       0.07     55.96   0.833
  A14                     71.67       0.00       0.00      20.51      38.84      12.83      51.67       0.08     61.65   0.721
  A15                     71.67       0.00       0.00       5.66      61.88       4.01      65.89       0.08     58.30   0.919
  A16                     71.67       0.00       0.00      11.32      52.37       7.78      60.14       0.05     37.83   0.839
  A17                     71.67       0.00       0.00      35.10      17.38      19.66      37.04       0.04     32.19   0.517
  A18                     71.67       0.00       0.00       8.23      57.60       5.49      63.09       0.08     61.78   0.880
  A19                     71.67       0.00       0.00       6.32      60.63       4.25      64.89       0.09     67.35   0.905
  A20                     71.67       0.00       0.00      21.16      37.84      13.19      51.03       0.09     69.11   0.712
  A21                     71.67       0.00       0.00       6.30      60.74       4.35      65.09       0.16    120.88   0.908
  A22                     71.67       0.00       0.00      25.45      30.65      16.37      47.01       0.02     20.48   0.656
  A23                     71.67       0.00       0.00      10.11      54.82       6.85      61.66       0.09     66.28   0.860
  A24                     71.67       0.00       0.00      13.29      49.53       8.81      58.35       0.09     69.13   0.814
  A25                     71.67       0.00       0.00      32.96      19.38      20.06      39.44       0.04     30.29   0.550
  A26                     71.67       0.00       0.00      10.14      54.44       6.75      61.19       0.11     84.61   0.854
  A27                     71.67       0.00       0.00      12.66      50.86       8.43      59.29       0.04     32.45   0.827
  U01                     71.67       0.00       0.00      30.81      21.46      21.32      42.78       0.01      8.71   0.597
  U02                     71.67       0.00       0.00      43.72       0.00      32.44      32.44       0.01     16.93   0.453
  U03                     71.67       0.00       0.00      43.72       0.00      32.44      32.44       0.02     25.39   0.453
  U04                     71.67       0.00       0.00       6.89      60.29       4.90      65.20       0.01      4.84   0.910
  U05                     71.67       0.00       0.00      40.34       6.06      27.34      33.40       0.01      8.12   0.466


******************
Node Depth Summary
******************

-----------------------------------------------------------------------------------------------
                                  Average    Maximum    Maximum  Time of Max      Reported
                                    Depth      Depth        HGL   Occurrence    Max Depth
Node                 Type          Meters     Meters     Meters  days hr:min        Meters
-----------------------------------------------------------------------------------------------
CB01                 JUNCTION        0.00       0.02      96.90    0  01:10          0.02
CBMH09-Dummy         JUNCTION        0.51       2.17      97.02    0  01:29          2.17
CBMH16-Dummy         JUNCTION        0.01       0.17      95.67    0  01:11          0.17
HP01                 JUNCTION        0.00       0.00      97.70    0  00:00          0.00
HP02                 JUNCTION        0.00       0.00      97.70    0  00:00          0.00
HP03                 JUNCTION        0.00       0.00      97.70    0  00:00          0.00
HP-CBMH01            JUNCTION        0.00       0.00      97.15    0  00:00          0.00
HP-CBMH02            JUNCTION        0.00       0.00      97.00    0  00:00          0.00
HP-CBMH03            JUNCTION        0.00       0.01      97.16    0  01:23          0.01
HP-CBMH04            JUNCTION        0.00       0.00      97.45    0  00:00          0.00
HP-CBMH05            JUNCTION        0.00       0.00      97.60    0  00:00          0.00
HP-CBMH06            JUNCTION        0.00       0.00      97.65    0  00:00          0.00
HP-CBMH07            JUNCTION        0.00       0.00      97.25    0  00:00          0.00
HP-CBMH08            JUNCTION        0.00       0.01      97.16    0  01:14          0.01
HP-CBMH09            JUNCTION        0.00       0.00      97.10    0  00:00          0.00
HP-CBMH10            JUNCTION        0.00       0.00      97.15    0  01:14          0.00
HP-CBMH11            JUNCTION        0.00       0.00      97.10    0  00:00          0.00
HP-CBMH12            JUNCTION        0.00       0.00      97.13    0  00:00          0.00
HP-CBMH13            JUNCTION        0.01       0.14      97.10    0  01:34          0.14
HP-CBMH14            JUNCTION        0.00       0.00      97.55    0  01:28          0.00
HP-CBMH15            JUNCTION        0.00       0.00      97.60    0  00:00          0.00
HP-RT06              JUNCTION        0.00       0.00      97.20    0  00:00          0.00
HP-RYE03             JUNCTION        0.00       0.00      97.95    0  00:00          0.00
HP-RYE04             JUNCTION        0.00       0.00      97.60    0  00:00          0.00
HP-RYE05             JUNCTION        0.00       0.00      97.60    0  00:00          0.00
HP-RYE06             JUNCTION        0.00       0.04      97.34    0  01:12          0.04
HP-RYE07             JUNCTION        0.00       0.00      97.20    0  00:00          0.00
HP-RYE08             JUNCTION        0.00       0.07      97.14    0  01:11          0.07
HP-RYE09             JUNCTION        0.00       0.00      97.10    0  00:00          0.00
HP-RYE11             JUNCTION        0.00       0.00      97.10    0  00:00          0.00
HP-RYE12             JUNCTION        0.01       0.10      97.55    0  01:29          0.10
```

HP-RYT01	JUNCTION	0.00	0.00	97.65	0	00:00	0.00
HP-RYT02	JUNCTION	0.00	0.04	97.52	0	01:38	0.04
HP-RYT03	JUNCTION	0.02	0.15	97.55	0	01:28	0.15
HP-RYT04	JUNCTION	0.00	0.00	97.45	0	01:23	0.00
HP-RYT05	JUNCTION	0.00	0.05	97.45	0	01:24	0.05
HP-RYT07	JUNCTION	0.00	0.00	97.05	0	00:00	0.00
HP-RYT09	JUNCTION	0.00	0.00	97.70	0	00:00	0.00
RYT01-Dummy	JUNCTION	0.20	2.20	97.58	0	01:21	2.20
RYT03-Dummy	JUNCTION	0.68	2.25	97.55	0	01:28	2.25
HP-CB01	OUTFALL	0.00	0.02	96.87	0	01:10	0.02
HP-CBMH16	OUTFALL	0.00	0.00	97.50	0	00:00	0.00
HP-RYE01	OUTFALL	0.00	0.00	97.60	0	00:00	0.00
HP-RYE02	OUTFALL	0.00	0.00	97.35	0	00:00	0.00
MH1013	OUTFALL	0.97	0.97	95.05	0	00:00	0.97
OF1	OUTFALL	0.00	0.00	97.40	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	98.20	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	97.40	0	00:00	0.00
CBMH01	STORAGE	0.45	2.18	97.04	0	01:26	2.18
CBMH02	STORAGE	0.71	2.35	96.99	0	01:26	2.35
CBMH03	STORAGE	0.57	2.33	97.16	0	01:23	2.33
CBMH04	STORAGE	0.54	2.47	97.45	0	01:27	2.47
CBMH05	STORAGE	0.18	2.24	97.47	0	01:14	2.24
CBMH06	STORAGE	0.21	2.24	97.58	0	01:20	2.23
CBMH07	STORAGE	0.35	2.27	97.19	0	01:21	2.27
CBMH08	STORAGE	0.46	2.21	97.16	0	01:14	2.21
CBMH09	STORAGE	0.53	2.19	97.02	0	01:29	2.19
CBMH10	STORAGE	0.19	2.13	97.15	0	01:14	2.13
CBMH11	STORAGE	0.19	1.82	97.03	0	01:21	1.82
CBMH12	STORAGE	0.60	2.29	97.10	0	01:34	2.29
CBMH13	STORAGE	0.59	2.28	97.10	0	01:34	2.28
CBMH14	STORAGE	0.73	2.37	97.55	0	01:28	2.37
CBMH15	STORAGE	0.26	1.88	97.48	0	01:46	1.88
CBMH16	STORAGE	0.04	1.70	97.20	0	01:11	1.69
MH200	STORAGE	0.03	0.28	95.40	0	01:13	0.28
MH202	STORAGE	0.14	0.36	95.29	0	01:13	0.36
MH204	STORAGE	0.37	0.51	95.20	0	01:14	0.51
MH206	STORAGE	0.53	0.64	95.17	0	01:14	0.64
MH208	STORAGE	0.67	0.75	95.14	0	01:14	0.75
MH210	STORAGE	0.80	0.86	95.12	0	01:14	0.86
MH212	STORAGE	0.92	0.96	95.10	0	01:14	0.96
MH214	STORAGE	0.95	0.98	95.08	0	01:14	0.98
MH218	STORAGE	0.03	0.28	95.48	0	01:12	0.28
MH220	STORAGE	0.35	0.43	95.14	0	01:14	0.43
MH222	STORAGE	0.33	0.40	95.13	0	01:14	0.40
MH224	STORAGE	0.45	0.51	95.12	0	01:14	0.51
MH230	STORAGE	0.13	0.23	95.16	0	01:14	0.23
RYE01	STORAGE	0.19	2.10	97.58	0	01:21	2.10
RYE02	STORAGE	0.03	1.59	97.21	0	01:11	1.58
RYE03	STORAGE	0.50	1.75	97.53	0	01:35	1.75
RYE04	STORAGE	0.65	2.18	97.55	0	01:28	2.18
RYE05	STORAGE	0.34	1.83	97.45	0	01:22	1.83
RYE06	STORAGE	0.28	1.89	97.34	0	01:12	1.89
RYE07	STORAGE	0.29	2.03	97.05	0	01:22	2.03
RYE08	STORAGE	0.27	1.90	97.15	0	01:11	1.90
RYE09	STORAGE	0.26	1.74	96.99	0	01:26	1.74
RYE10	STORAGE	0.24	1.49	97.17	0	01:16	1.49
RYE11	STORAGE	0.50	2.16	97.02	0	01:29	2.16
RYE12	STORAGE	0.58	2.00	97.55	0	01:29	2.00
RYT01	STORAGE	0.21	2.22	97.58	0	01:21	2.22
RYT02	STORAGE	0.59	2.00	97.53	0	01:38	2.00
RYT03	STORAGE	0.72	2.33	97.55	0	01:29	2.33
RYT04	STORAGE	0.38	2.03	97.45	0	01:23	2.03
RYT05	STORAGE	0.45	2.31	97.45	0	01:24	2.31
RYT06	STORAGE	0.54	2.30	97.16	0	01:23	2.30
RYT07	STORAGE	0.68	2.32	96.99	0	01:27	2.32
RYT08	STORAGE	0.34	2.00	97.16	0	01:14	2.00
RYT09	STORAGE	0.52	1.83	97.53	0	01:35	1.83

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	32.45	32.45	0	01:10	0.0415	0.0415	-0.027
CBMH09-Dummy	JUNCTION	0.00	39.30	0	00:00	0	0.00491	0.840
CBMH16-Dummy	JUNCTION	0.00	28.38	0	01:11	0	0.0435	0.872

HP01	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP03	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH01	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH03	JUNCTION	0.00	19.43	0	01:23	0	0.00982	0.008	
HP-CBMH04	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH05	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH06	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH07	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH08	JUNCTION	0.00	19.65	0	01:14	0	0.0104	-0.002	
HP-CBMH09	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH10	JUNCTION	0.00	6.32	0	01:14	0	0.000625	0.026	
HP-CBMH11	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH12	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-CBMH13	JUNCTION	0.00	45.56	0	01:08	0	0.0362	-0.026	
HP-CBMH14	JUNCTION	0.00	5.78	0	01:28	0	0.00275	0.019	
HP-CBMH15	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RT06	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE03	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE04	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE05	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE06	JUNCTION	0.00	8.39	0	01:10	0	0.00145	-2.241	
HP-RYE07	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE08	JUNCTION	0.00	18.46	0	01:10	0	0.00524	-1.790	
HP-RYE09	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE11	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE12	JUNCTION	0.00	17.88	0	01:13	0	0.0107	0.368	
HP-RYT01	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYT02	JUNCTION	0.00	12.74	0	01:38	0	0.0413	-0.002	
HP-RYT03	JUNCTION	0.00	3.48	0	01:13	0	0.00463	3.953	
HP-RYT04	JUNCTION	0.00	0.70	0	01:21	0	3.35e-05	4.976	
HP-RYT05	JUNCTION	0.00	11.70	0	01:10	0	0.018	0.710	
HP-RYT07	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYT09	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	ltr
RYT01-Dummy	JUNCTION	0.00	20.25	0	01:02	0	0.0122	-2.523	
RYT03-Dummy	JUNCTION	0.00	24.56	0	01:10	0	0.0338	0.533	
HP-CB01	OUTFALL	0.00	23.38	0	01:10	0	0.0336	0.000	
HP-CBMH16	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE01	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
HP-RYE02	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
MH1013	OUTFALL	0.00	316.32	0	01:14	0	2.03	0.000	
OF1	OUTFALL	16.93	16.93	0	01:10	0.013	0.013	0.000	
OF2	OUTFALL	30.23	30.23	0	01:10	0.026	0.026	0.000	
OF3	OUTFALL	16.83	16.83	0	01:10	0.0152	0.0152	0.000	
CBMH01	STORAGE	61.78	76.39	0	01:10	0.082	0.128	0.097	
CBMH02	STORAGE	120.88	166.57	0	01:10	0.163	0.258	0.087	
CBMH03	STORAGE	58.30	91.65	0	01:09	0.079	0.176	0.126	
CBMH04	STORAGE	58.30	90.92	0	01:10	0.0789	0.163	0.065	
CBMH05	STORAGE	58.62	58.62	0	01:10	0.08	0.08	0.238	
CBMH06	STORAGE	101.54	135.63	0	01:08	0.136	0.186	0.030	
CBMH07	STORAGE	149.48	149.48	0	01:10	0.2	0.204	-0.221	
CBMH08	STORAGE	66.28	79.49	0	01:10	0.0863	0.114	0.141	
CBMH09	STORAGE	84.61	113.70	0	01:10	0.11	0.166	0.146	
CBMH10	STORAGE	69.13	69.13	0	01:10	0.0875	0.0886	0.146	
CBMH11	STORAGE	67.35	67.35	0	01:10	0.0908	0.0908	0.149	
CBMH12	STORAGE	37.83	82.08	0	01:08	0.0481	0.0787	0.069	
CBMH13	STORAGE	55.96	55.96	0	01:10	0.0716	0.089	0.175	
CBMH14	STORAGE	63.16	71.95	0	01:09	0.0852	0.175	0.165	
CBMH15	STORAGE	43.18	43.18	0	01:10	0.0573	0.0986	0.061	
CBMH16	STORAGE	18.91	31.83	0	01:10	0.0243	0.0435	0.037	
MH200	STORAGE	0.00	79.13	0	01:12	0	0.318	-0.042	
MH202	STORAGE	0.00	105.42	0	01:12	0	0.557	-0.011	
MH204	STORAGE	0.00	118.77	0	01:14	0	0.716	-0.001	
MH206	STORAGE	0.00	165.26	0	01:14	0	0.989	0.002	
MH208	STORAGE	0.00	191.19	0	01:14	0	1.22	0.000	
MH210	STORAGE	0.00	229.41	0	01:15	0	1.43	-0.000	
MH212	STORAGE	0.00	314.99	0	01:15	0	2.03	0.001	
MH214	STORAGE	0.00	316.30	0	01:14	0	2.03	-0.000	
MH218	STORAGE	0.00	63.92	0	01:12	0	0.22	-0.119	
MH220	STORAGE	0.00	38.28	0	01:23	0	0.219	-0.005	
MH222	STORAGE	0.00	33.56	0	01:18	0	0.188	-0.003	
MH224	STORAGE	0.00	53.70	0	01:21	0	0.346	0.001	
MH230	STORAGE	0.00	22.67	0	01:14	0	0.0884	-0.010	
RYE01	STORAGE	0.00	9.90	0	01:09	0	0.00416	0.374	
RYE02	STORAGE	15.94	15.94	0	01:10	0.0191	0.0191	-0.021	
RYE03	STORAGE	0.00	6.61	0	01:05	0	0.0027	0.076	
RYE04	STORAGE	26.95	26.95	0	01:10	0.0321	0.0322	0.475	
RYE05	STORAGE	0.00	13.96	0	01:04	0	0.00624	0.107	
RYE06	STORAGE	61.65	61.70	0	01:10	0.0774	0.0954	0.051	
RYE07	STORAGE	32.19	32.19	0	01:10	0.0444	0.0453	0.186	
RYE08	STORAGE	69.11	69.11	0	01:10	0.0867	0.0868	0.101	

RYE09	STORAGE	0.00	15.55	0	01:04	0	0.00552	0.158
RYE10	STORAGE	20.48	20.48	0	01:10	0.0235	0.0237	0.144
RYE11	STORAGE	30.29	30.29	0	01:10	0.0355	0.0389	0.137
RYE12	STORAGE	0.00	30.87	0	01:12	0	0.0184	0.991
RYT01	STORAGE	33.23	81.65	0	01:06	0.0403	0.0585	0.269
RYT02	STORAGE	0.00	44.76	0	01:05	0	0.084	0.089
RYT03	STORAGE	64.29	95.11	0	01:04	0.0841	0.184	-0.347
RYT04	STORAGE	0.00	40.36	0	01:04	0	0.0278	0.166
RYT05	STORAGE	77.24	82.73	0	01:04	0.0969	0.123	0.056
RYT06	STORAGE	0.00	47.80	0	01:12	0	0.0968	-0.094
RYT07	STORAGE	0.00	66.27	0	01:04	0	0.1	0.090
RYT08	STORAGE	0.00	19.05	0	01:05	0	0.0269	-0.153
RYT09	STORAGE	0.00	22.08	0	01:05	0	0.0119	-0.028

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH09-Dummy	JUNCTION	2.06	1.574	0.976
RYT01-Dummy	JUNCTION	1.08	1.596	1.064
RYT03-Dummy	JUNCTION	6.24	1.653	0.147

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CBMH01	0.003	3	0	0	0.036	39	0 01:26	29.06
CBMH02	0.007	9	0	0	0.076	90	0 01:26	67.80
CBMH03	0.005	11	0	0	0.049	100	0 01:23	38.77
CBMH04	0.006	11	0	0	0.047	95	0 01:27	41.62
CBMH05	0.001	2	0	0	0.022	34	0 01:14	20.13
CBMH06	0.002	4	0	0	0.035	63	0 01:20	87.84
CBMH07	0.004	6	0	0	0.048	71	0 01:21	39.37
CBMH08	0.005	12	0	0	0.037	100	0 01:14	30.53
CBMH09	0.006	5	0	0	0.063	55	0 01:29	39.30
CBMH10	0.002	6	0	0	0.026	99	0 01:14	28.99
CBMH11	0.002	4	0	0	0.030	64	0 01:21	18.14
CBMH12	0.005	10	0	0	0.038	80	0 01:34	22.69
CBMH13	0.004	14	0	0	0.026	85	0 01:34	52.73
CBMH14	0.006	17	0	0	0.033	99	0 01:28	45.43
CBMH15	0.001	4	0	0	0.014	37	0 01:46	15.34
CBMH16	0.000	2	0	0	0.002	58	0 01:11	28.38
MH200	0.000	1	0	0	0.000	11	0 01:13	79.00
MH202	0.000	5	0	0	0.000	14	0 01:13	105.03
MH204	0.000	14	0	0	0.001	19	0 01:14	118.82
MH206	0.001	19	0	0	0.001	23	0 01:14	165.33
MH208	0.001	25	0	0	0.001	28	0 01:14	191.26
MH210	0.001	28	0	0	0.001	30	0 01:14	229.50
MH212	0.001	33	0	0	0.001	34	0 01:14	315.05
MH214	0.001	34	0	0	0.001	35	0 01:14	316.32
MH218	0.000	1	0	0	0.000	12	0 01:12	63.83
MH220	0.000	14	0	0	0.000	18	0 01:14	38.32
MH222	0.000	14	0	0	0.000	17	0 01:14	33.59
MH224	0.001	19	0	0	0.001	22	0 01:14	53.75
MH230	0.000	6	0	0	0.000	11	0 01:14	22.68
RYE01	0.000	6	0	0	0.001	71	0 01:21	3.81
RYE02	0.000	1	0	0	0.001	62	0 01:11	13.52
RYE03	0.000	4	0	0	0.001	13	0 01:35	1.34
RYE04	0.000	22	0	0	0.001	75	0 01:28	24.56
RYE05	0.000	12	0	0	0.001	67	0 01:22	3.46
RYE06	0.000	11	0	0	0.001	73	0 01:12	51.81
RYE07	0.001	4	0	0	0.010	50	0 01:22	18.78
RYE08	0.000	10	0	0	0.001	73	0 01:11	60.50
RYE09	0.000	10	0	0	0.001	67	0 01:26	8.17
RYE10	0.000	10	0	0	0.001	64	0 01:16	19.05
RYE11	0.000	17	0	0	0.001	74	0 01:29	29.85
RYE12	0.003	16	0	0	0.016	99	0 01:29	1.86
RYT01	0.000	7	0	0	0.001	75	0 01:21	35.71
RYT02	0.004	11	0	0	0.022	61	0 01:38	22.08
RYT03	0.003	17	0	0	0.016	99	0 01:29	58.49
RYT04	0.000	14	0	0	0.001	74	0 01:23	13.96
RYT05	0.000	15	0	0	0.001	79	0 01:24	60.72
RYT06	0.000	18	0	0	0.001	77	0 01:23	39.95
RYT07	0.000	22	0	0	0.001	77	0 01:27	52.01
RYT08	0.000	11	0	0	0.001	66	0 01:14	17.41
RYT09	0.000	7	0	0	0.001	23	0 01:35	6.61

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
HP-CB01	22.01	3.58	23.38	0.034
HP-CBMH16	0.00	0.00	0.00	0.000
HP-RYE01	0.00	0.00	0.00	0.000
HP-RYE02	0.00	0.00	0.00	0.000
MH1013	89.67	49.21	316.32	2.034
OF1	7.94	4.09	16.93	0.013
OF2	21.51	2.96	30.23	0.026
OF3	21.39	1.76	16.83	0.015
System	20.32	61.61	400.27	2.121

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
CBMH16-MH218	CONDUIT	28.39	0 01:11	0.81	0.71	0.67
Dummy-CBMH09	CONDUIT	39.30	0 00:00	0.69	0.17	1.00
MH200-MH202	CONDUIT	79.00	0 01:12	0.88	0.90	0.76
MH202-MH204	CONDUIT	105.03	0 01:14	0.70	0.81	0.89
MH204-MH206	CONDUIT	118.82	0 01:14	0.55	0.59	0.98
MH206-MH208	CONDUIT	165.33	0 01:14	0.58	0.65	1.00
MH208-MH210	CONDUIT	191.26	0 01:15	0.53	0.58	1.00
MH210-MH212	CONDUIT	229.50	0 01:15	0.52	0.61	1.00
MH212-MH214	CONDUIT	315.05	0 01:15	0.59	0.67	1.00
MH214-MH1013	CONDUIT	316.32	0 01:14	0.59	0.66	1.00
MH218-MH200	CONDUIT	63.83	0 01:12	0.81	0.69	0.67
MH220-MH210	CONDUIT	38.32	0 01:24	0.35	0.43	1.00
MH222-MH224	CONDUIT	33.59	0 01:18	0.30	0.35	1.00
MH224-MH212	CONDUIT	53.75	0 01:21	0.34	0.42	1.00
MH230-MH222	CONDUIT	22.68	0 01:18	0.47	0.56	0.97
MS-CB01	CONDUIT	23.38	0 01:10	0.45	0.00	0.02
MS-CBMH01(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
MS-CBMH01(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.12
MS-CBMH02(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.14
MS-CBMH02(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.01
MS-CBMH03(1)	CONDUIT	19.43	0 01:23	0.04	0.00	0.16
MS-CBMH03(2)	CONDUIT	19.43	0 01:23	0.05	0.00	0.14
MS-CBMH04(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.15
MS-CBMH04(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.12
MS-CBMH05(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.08
MS-CBMH05(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
MS-CBMH06(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.11
MS-CBMH06(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
MS-CBMH07(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.12
MS-CBMH07(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.13
MS-CBMH08(1)	CONDUIT	19.65	0 01:14	0.04	0.00	0.16
MS-CBMH08(2)	CONDUIT	19.66	0 01:14	0.07	0.00	0.11
MS-CBMH09(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.11
MS-CBMH09(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.14
MS-CBMH10(1)	CONDUIT	6.32	0 01:14	0.01	0.00	0.15
MS-CBMH10(2)	CONDUIT	6.32	0 01:14	0.02	0.00	0.11

MS-CBMH11(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-CBMH11(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-CBMH12(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-CBMH12(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-CBMH13(1)	CONDUIT	45.56	0	01:08	0.18	0.00	0.20
MS-CBMH13(2)	CONDUIT	45.41	0	01:08	0.20	0.00	0.20
MS-CBMH14(1)	CONDUIT	5.78	0	01:28	0.01	0.00	0.15
MS-CBMH14(2)	CONDUIT	5.78	0	01:28	0.02	0.00	0.12
MS-CBMH15(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-CBMH15(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-CBMH16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-HP01(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-HP01(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-HP02(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-HP02(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-HP03	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-RYE01	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
MS-RYE02	CONDUIT	0.00	0	00:00	0.00	0.00	0.01
MS-RYE03(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-RYE03(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
MS-RYE04(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-RYE04(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-RYE05(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-RYE05(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS-RYE06(1)	CONDUIT	8.39	0	01:10	0.08	0.00	0.16
MS-RYE06(2)	CONDUIT	5.49	0	01:12	0.05	0.00	0.16
MS-RYE07(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.10
MS-RYE07(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-RYE08(1)	CONDUIT	18.46	0	01:10	0.12	0.00	0.18
MS-RYE08(2)	CONDUIT	17.11	0	01:11	0.16	0.00	0.15
MS-RYE09(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.07
MS-RYE09(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-RYE10(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS-RYE10(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-RYE11(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
MS-RYE11(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
MS-RYE12(1)	CONDUIT	17.44	0	01:13	0.15	0.00	0.20
MS-RYE12(2)	CONDUIT	17.88	0	01:13	0.15	0.00	0.20
MS-RYT01(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-RYT01(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
MS-RYT01(3)	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
MS-RYT02(1)	CONDUIT	12.74	0	01:38	0.10	0.00	0.16
MS-RYT02(2)	CONDUIT	12.74	0	01:38	0.46	0.00	0.11
MS-RYT03(1)	CONDUIT	3.02	0	01:13	0.03	0.00	0.23
MS-RYT03(2)	CONDUIT	3.48	0	01:13	0.03	0.00	0.23
MS-RYT04(1)	CONDUIT	0.70	0	01:21	0.01	0.00	0.15
MS-RYT04(2)	CONDUIT	0.02	0	01:23	0.00	0.00	0.20
MS-RYT05(1)	CONDUIT	11.70	0	01:10	0.07	0.00	0.22
MS-RYT05(2)	CONDUIT	9.02	0	01:24	0.14	0.00	0.16
MS-RYT06(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-RYT06(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-RYT07(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-RYT07(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-RYT09(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-RYT09(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
RYE01-RYT01-Dummy	CONDUIT	9.90	0	01:09	0.20	0.23	1.00
RYE02-CBMH16	CONDUIT	13.52	0	01:12	0.41	0.32	1.00
RYE03-RYT09	CONDUIT	6.61	0	01:05	0.17	0.16	1.00
RYE04-RYT03(1)	CONDUIT	24.56	0	01:10	0.50	0.60	1.00
RYE04-RYT03(2)	CONDUIT	24.38	0	01:10	0.19	0.11	1.00
RYE05-RYT04	CONDUIT	13.96	0	01:04	0.28	0.33	1.00
RYE06-RYT06	CONDUIT	43.43	0	01:10	0.88	1.02	1.00
RYE07-CBMH01	CONDUIT	18.78	0	02:25	0.38	0.44	1.00
RYE08-RYT07	CONDUIT	42.38	0	01:09	0.86	1.01	1.00
RYE09-RYT02	CONDUIT	22.08	0	01:05	0.45	0.51	1.00
RYE09-RYT07	CONDUIT	15.55	0	01:04	0.32	0.37	1.00
RYE10-RYT08	CONDUIT	19.05	0	01:05	0.45	0.45	1.00
RYE11-CBMH09	CONDUIT	29.85	0	01:10	0.31	0.11	1.00
RYE12-RYT03	CONDUIT	23.11	0	01:10	0.47	0.54	1.00
RYT01-CBMH06	CONDUIT	53.71	0	01:06	0.19	0.25	1.00
RYT01-Dummy-RYT01	CONDUIT	20.25	0	01:02	0.07	0.11	1.00
RYT02-RYT03	CONDUIT	44.76	0	01:05	0.91	1.06	1.00
RYT03-CBMH14	CONDUIT	39.32	0	01:04	0.27	0.17	1.00
RYT04-RYT05	CONDUIT	40.36	0	01:04	0.82	0.95	1.00
RYT05-CBMH04	CONDUIT	32.87	0	01:10	0.67	0.78	1.00
RYT06-CBMH03	CONDUIT	39.95	0	01:12	0.14	0.17	1.00
RYT07-CBMH02	CONDUIT	50.24	0	01:10	0.11	0.12	1.00
RYT08-CBMH08	CONDUIT	17.41	0	01:05	0.35	0.29	1.00
O-CBMH01	ORIFICE	20.17	0	01:30			1.00
O-CBMH02	ORIFICE	32.21	0	01:29			1.00
O-CBMH03	ORIFICE	19.35	0	01:31			1.00
O-CBMH04	ORIFICE	14.03	0	02:15			1.00
O-CBMH05	ORIFICE	20.13	0	01:18			1.00
O-CBMH06	ORIFICE	36.24	0	01:25			1.00
O-CBMH07	ORIFICE	39.37	0	01:23			1.00
O-CBMH08	ORIFICE	10.88	0	01:20			1.00
O-CBMH09	ORIFICE	20.19	0	01:31			1.00
O-CBMH10	ORIFICE	22.67	0	01:14			1.00
O-CBMH11	ORIFICE	18.14	0	01:21			1.00
O-CBMH12	ORIFICE	6.87	0	01:35			1.00
O-CBMH13	ORIFICE	7.42	0	02:11			1.00
O-CBMH14	ORIFICE	6.57	0	01:49			1.00
O-CBMH15	ORIFICE	15.34	0	01:46			1.00
O-CBMH16	ORIFICE	28.38	0	01:11			1.00
O-CB01	DUMMY	9.06	0	01:10			

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Flow Classification Summary
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	Adjusted	Fraction of Time in Flow Class								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
CBMH16-MH218	1.00	0.01	0.00	0.00	0.09	0.00	0.00	0.90	0.03	0.00
Dummy-CBMH09	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH200-MH202	1.00	0.00	0.06	0.00	0.88	0.00	0.00	0.05	0.90	0.00
MH202-MH204	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH204-MH206	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH206-MH208	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH208-MH210	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH210-MH212	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH212-MH214	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH214-MH1013	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH218-MH200	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
MH220-MH210	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH222-MH224	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH224-MH212	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH230-MH222	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MS-CB01	1.00	0.74	0.00	0.00	0.24	0.02	0.00	0.00	0.00	0.00
MS-CBMH01(1)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH01(2)	1.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH02(1)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH02(2)	1.00	0.74	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH03(1)	1.00	0.85	0.12	0.00	0.04	0.00	0.00	0.00	0.93	0.00
MS-CBMH03(2)	1.00	0.83	0.14	0.00	0.04	0.00	0.00	0.00	0.94	0.00
MS-CBMH04(1)	1.00	0.82	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH04(2)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH05(1)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH05(2)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH06(1)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH06(2)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH07(1)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH07(2)	1.00	0.84	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH08(1)	1.00	0.84	0.12	0.00	0.04	0.00	0.00	0.00	0.93	0.00
MS-CBMH08(2)	1.00	0.85	0.11	0.00	0.04	0.00	0.00	0.00	0.95	0.00
MS-CBMH09(1)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH09(2)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH10(1)	1.00	0.94	0.05	0.00	0.01	0.00	0.00	0.00	0.95	0.00
MS-CBMH10(2)	1.00	0.85	0.14	0.00	0.01	0.00	0.00	0.00	0.95	0.00
MS-CBMH11(1)	1.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH11(2)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH12(1)	1.00	0.83	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH12(2)	1.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH13(1)	1.00	0.84	0.02	0.00	0.14	0.00	0.00	0.00	0.89	0.00
MS-CBMH13(2)	1.00	0.83	0.03	0.00	0.14	0.00	0.00	0.00	0.89	0.00
MS-CBMH14(1)	1.00	0.73	0.25	0.00	0.03	0.00	0.00	0.00	0.93	0.00
MS-CBMH14(2)	1.00	0.90	0.07	0.00	0.03	0.00	0.00	0.00	0.94	0.00
MS-CBMH15(1)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH15(2)	1.00	0.73	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP01(1)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP01(2)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP02(1)	1.00	0.82	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP02(2)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP03	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE01	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE02	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE03(1)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE03(2)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE04(1)	1.00	0.74	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE04(2)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MS-RYE05(1)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE05(2)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE06(1)	1.00	0.84	0.01	0.00	0.11	0.00	0.00	0.04	0.05	0.00
MS-RYE06(2)	1.00	0.84	0.01	0.00	0.15	0.00	0.00	0.01	0.07	0.00
MS-RYE07(1)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE07(2)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE08(1)	1.00	0.84	0.00	0.00	0.11	0.00	0.00	0.04	0.05	0.00
MS-RYE08(2)	1.00	0.84	0.00	0.00	0.13	0.00	0.00	0.02	0.07	0.00
MS-RYE09(1)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE09(2)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE10(1)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE10(2)	1.00	0.84	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE11(1)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE11(2)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE12(1)	1.00	0.73	0.08	0.00	0.19	0.00	0.00	0.00	0.84	0.00
MS-RYE12(2)	1.00	0.73	0.08	0.00	0.19	0.00	0.00	0.00	0.84	0.00
MS-RYT01(1)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT01(2)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT01(3)	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT02(1)	1.00	0.73	0.12	0.00	0.15	0.00	0.00	0.00	0.87	0.00
MS-RYT02(2)	1.00	0.82	0.03	0.00	0.10	0.00	0.00	0.05	0.05	0.00
MS-RYT03(1)	1.00	0.73	0.04	0.00	0.23	0.00	0.00	0.00	0.81	0.00
MS-RYT03(2)	1.00	0.73	0.04	0.00	0.23	0.00	0.00	0.00	0.81	0.00
MS-RYT04(1)	1.00	0.81	0.03	0.00	0.15	0.00	0.00	0.01	0.08	0.00
MS-RYT04(2)	1.00	0.81	0.03	0.00	0.15	0.00	0.00	0.01	0.09	0.00
MS-RYT05(1)	1.00	0.81	0.01	0.00	0.17	0.00	0.00	0.01	0.06	0.00
MS-RYT05(2)	1.00	0.81	0.01	0.00	0.11	0.00	0.00	0.07	0.05	0.00
MS-RYT06(1)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT06(2)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT07(1)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT07(2)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT09(1)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT09(2)	1.00	0.73	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE01-RYT01-Dummy	1.00	0.02	0.01	0.00	0.19	0.00	0.00	0.78	0.89	0.00
RYE02-CBMH16	1.00	0.01	0.00	0.00	0.07	0.00	0.00	0.93	0.01	0.00
RYE03-RYT09	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.69	0.00
RYE04-RYT03(1)	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.65	0.00
RYE04-RYT03(2)	1.00	0.01	0.00	0.00	0.42	0.00	0.00	0.57	0.00	0.00
RYE05-RYT04	1.00	0.03	0.71	0.00	0.26	0.00	0.00	0.00	0.83	0.00
RYE06-RYT06	1.00	0.01	0.00	0.00	0.19	0.00	0.00	0.80	0.01	0.00
RYE07-CBMH01	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYE08-RYT07	1.00	0.01	0.00	0.00	0.21	0.00	0.00	0.79	0.02	0.00
RYE09-RYT02	1.00	0.03	0.56	0.00	0.41	0.00	0.00	0.00	0.68	0.00
RYE09-RYT07	1.00	0.02	0.02	0.00	0.19	0.00	0.00	0.77	0.01	0.00
RYE10-RYT08	1.00	0.01	0.00	0.00	0.19	0.00	0.00	0.80	0.00	0.00
RYE11-CBMH09	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYE12-RYT03	1.00	0.03	0.00	0.00	0.38	0.00	0.00	0.59	0.01	0.00
RYT01-CBMH06	1.00	0.01	0.01	0.00	0.98	0.00	0.00	0.00	0.27	0.00
RYT01-Dummy-RYT01	1.00	0.02	0.74	0.00	0.24	0.00	0.00	0.00	0.86	0.00
RYT02-RYT03	1.00	0.02	0.01	0.00	0.41	0.00	0.00	0.56	0.03	0.00
RYT03-CBMH14	1.00	0.01	0.00	0.00	0.43	0.00	0.00	0.56	0.00	0.00
RYT04-RYT05	1.00	0.02	0.01	0.00	0.23	0.00	0.00	0.74	0.01	0.00
RYT05-CBMH04	1.00	0.00	0.24	0.00	0.76	0.00	0.00	0.00	0.84	0.00
RYT06-CBMH03	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYT07-CBMH02	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYT08-CBMH08	1.00	0.00	0.63	0.00	0.37	0.00	0.00	0.00	0.87	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
Dummy-CBMH09	2.06	2.06	2.07	0.01	0.01
MH204-MH206	0.01	0.01	0.84	0.01	0.01
MH206-MH208	0.79	0.79	2.03	0.01	0.01
MH208-MH210	1.73	1.73	24.00	0.01	0.01
MH210-MH212	24.00	24.00	24.00	0.01	0.01
MH212-MH214	24.00	24.00	24.00	0.01	0.01
MH214-MH1013	24.00	24.00	24.00	0.01	0.91
MH220-MH210	1.21	1.21	24.00	0.01	0.01
MH222-MH224	0.80	0.80	2.37	0.01	0.01
MH224-MH212	2.06	2.06	24.00	0.01	0.01
MH230-MH222	0.01	0.01	0.85	0.01	0.01
RYE01-RYT01-Dummy	1.26	1.26	1.41	0.01	0.01
RYE02-CBMH16	0.31	0.31	0.34	0.01	0.01
RYE03-RYT09	6.02	6.02	6.15	0.01	0.01
RYE04-RYT03(1)	7.09	7.09	7.39	0.01	0.01
RYE04-RYT03(2)	6.24	6.24	6.29	0.01	0.01
RYE05-RYT04	2.86	2.86	3.02	0.01	0.01
RYE06-RYT06	2.17	2.17	2.32	0.05	0.15
RYE07-CBMH01	1.72	1.72	1.93	0.01	0.01
RYE08-RYT07	2.05	2.05	2.23	0.01	0.12
RYE09-RYT02	6.15	6.15	6.54	0.01	0.01
RYE09-RYT07	2.05	2.05	2.23	0.01	0.01
RYE10-RYT08	2.25	2.25	2.34	0.01	0.01
RYE11-CBMH09	2.05	2.05	2.07	0.01	0.01
RYE12-RYT03	6.49	6.49	6.67	0.01	0.01
RYT01-CBMH06	1.08	1.08	1.09	0.01	0.01
RYT01-Dummy-RYT01	1.08	1.08	1.08	0.01	0.01
RYT02-RYT03	6.54	6.54	7.35	0.01	0.01
RYT03-CBMH14	6.44	6.44	6.46	0.01	0.14
RYT04-RYT05	3.02	3.02	3.27	0.01	0.01
RYT05-CBMH04	3.35	3.35	3.51	0.01	0.01
RYT06-CBMH03	2.35	2.35	2.37	0.01	0.01
RYT07-CBMH02	2.11	2.11	2.14	0.01	0.01
RYT08-CBMH08	2.60	2.60	2.78	0.01	0.01

Analysis begun on: Wed Sep 29 09:28:56 2021
Analysis ended on: Wed Sep 29 09:28:58 2021
Total elapsed time: 00:00:02

Fernbank Zens – 5331 Fernbank Road (121011)
PCSWMM Model Output
100-year, 24hr SCS - JFSA

NOVATECH
Engineers, Planners & Landscape Architects

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
  ----------------------------------------------------------------

  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 32
  Number of nodes ........... 98
  Number of links ........... 131
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                  Data       Recording
  Name                 Data Source                Type       Interval
  ----------------------------------------------------------------------
  RG-1                 S24hr-100yr-JFSA           INTENSITY  12 min.


  *********************
  Subcatchment Summary
  *********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
  ----------------------------------------------------------------------------------------------------
---
  A01                        0.04     20.00     45.70    1.5000 RG-1                 RYE02
  A02                        0.04     26.67     74.30    1.5000 RG-1                 CBMH16
  A03                        0.08     40.00     51.40    1.5000 RG-1                 RYT01
  A04                        0.21     84.00     85.70    1.5000 RG-1                 CBMH06
  A05                        0.09     36.00     82.90    1.5000 RG-1                 CBMH15
  A06                        0.12     60.00     90.00    1.5000 RG-1                 CBMH05
  A07                        0.18     51.43     45.70    1.5000 RG-1                 RYT03
  A08                        0.07     35.00     41.40    1.5000 RG-1                 RYE04
  A09                        0.13     65.00     87.10    1.5000 RG-1                 CBMH14
  A10                        0.19     76.00     52.90    1.5000 RG-1                 RYT05
  A11                        0.12     60.00     87.10    1.5000 RG-1                 CBMH04
  A12                        0.32     80.00     80.00    1.5000 RG-1                 CBMH07
  A13                        0.12     60.00     72.90    1.5000 RG-1                 CBMH13
  A14                        0.15     60.00     54.30    1.5000 RG-1                 RYE06
  A15                        0.12     60.00     87.10    1.5000 RG-1                 CBMH03
  A16                        0.08     53.33     74.30    1.5000 RG-1                 CBMH12
  A17                        0.12     34.29     24.30    1.5000 RG-1                 RYE07
  A18                        0.13     43.33     81.40    1.5000 RG-1                 CBMH01
  A19                        0.14     40.00     85.70    1.5000 RG-1                 CBMH11
  A20                        0.17     68.00     52.90    1.5000 RG-1                 RYE08
  A21                        0.25    100.00     85.70    1.5000 RG-1                 CBMH02
  A22                        0.05     33.33     42.90    1.5000 RG-1                 RYE10
  A23                        0.14     70.00     77.10    1.5000 RG-1                 CBMH08
  A24                        0.15     75.00     70.00    1.5000 RG-1                 CBMH10
  A25                        0.09     45.00     27.10    1.5000 RG-1                 RYE11
  A26                        0.18     72.00     77.10    1.5000 RG-1                 CBMH09
  A27                        0.07     35.00     71.40    1.5000 RG-1                 CB01
  U01                        0.02     40.00     30.00    1.5000 RG-1                 OF3
  U02                        0.04     80.00      0.00   33.3300 RG-1                 OF1
  U03                        0.06    120.00      0.00   33.3300 RG-1                 OF2
  U04                        0.01      6.67     84.30    1.5000 RG-1                 OF2
  U05                        0.02     40.00      8.60    1.5000 RG-1                 OF3


  ************
  Node Summary
  ************
                                        Invert      Max.    Ponded    External
  Name                 Type               Elev.     Depth      Area    Inflow
  ----------------------------------------------------------------------------
  CB01                 JUNCTION          96.88      1.00       0.0
  CBMH09-Dummy         JUNCTION          94.85      3.15       0.0
  CBMH16-Dummy         JUNCTION          95.50      1.95       0.0
  HP01                 JUNCTION          97.70      1.00       0.0
  HP02                 JUNCTION          97.70      1.00       0.0
  HP03                 JUNCTION          97.70      1.00       0.0
  HP-CBMH01            JUNCTION          97.15      1.00       0.0
  HP-CBMH02            JUNCTION          97.00      1.00       0.0
  HP-CBMH03            JUNCTION          97.15      1.00       0.0
  HP-CBMH04            JUNCTION          97.45      1.00       0.0
  HP-CBMH05            JUNCTION          97.60      1.00       0.0
  HP-CBMH06            JUNCTION          97.65      1.00       0.0
  HP-CBMH07            JUNCTION          97.25      1.00       0.0
  HP-CBMH08            JUNCTION          97.15      1.00       0.0
  HP-CBMH09            JUNCTION          97.10      1.00       0.0
  HP-CBMH10            JUNCTION          97.15      1.00       0.0
  HP-CBMH11            JUNCTION          97.10      1.00       0.0
  HP-CBMH12            JUNCTION          97.13      1.00       0.0
  HP-CBMH13            JUNCTION          96.96      1.00       0.0
  HP-CBMH14            JUNCTION          97.55      1.00       0.0
  HP-CBMH15            JUNCTION          97.60      1.00       0.0
  HP-RT06              JUNCTION          97.20      1.00       0.0
  HP-RYE03             JUNCTION          97.95      1.00       0.0
  HP-RYE04             JUNCTION          97.60      1.00       0.0
  HP-RYE05             JUNCTION          97.60      1.00       0.0
  HP-RYE06             JUNCTION          97.30      1.00       0.0
  HP-RYE07             JUNCTION          97.20      1.00       0.0
  HP-RYE08             JUNCTION          97.07      1.00       0.0
  HP-RYE09             JUNCTION          97.10      1.00       0.0
  HP-RYE11             JUNCTION          97.10      1.00       0.0
  HP-RYE12             JUNCTION          97.45      1.00       0.0
  HP-RYT01             JUNCTION          97.65      1.00       0.0
  HP-RYT02             JUNCTION          97.48      1.00       0.0
  HP-RYT03             JUNCTION          97.40      1.00       0.0
  HP-RYT04             JUNCTION          97.45      1.00       0.0
  HP-RYT05             JUNCTION          97.40      1.00       0.0
  HP-RYT07             JUNCTION          97.05      1.03       0.0
  HP-RYT09             JUNCTION          97.70      1.00       0.0
  RYT01-Dummy          JUNCTION          95.38      3.26       0.0
  RYT03-Dummy          JUNCTION          95.30      2.40       0.0
  HP-CB01              OUTFALL           96.85      1.00       0.0
  HP-CBMH16            OUTFALL           97.50      1.00       0.0
  HP-RYE01             OUTFALL           97.60      1.00       0.0
  HP-RYE02             OUTFALL           97.35      1.00       0.0
  MH1013               OUTFALL           94.08      0.82       0.0
  OF1                  OUTFALL           97.40      0.00       0.0
  OF2                  OUTFALL           98.20      0.00       0.0
  OF3                  OUTFALL           97.40      0.00       0.0
  CBMH01               STORAGE           94.86      2.99       0.0
  CBMH02               STORAGE           94.64      3.06       0.0
  CBMH03               STORAGE           94.83      3.02       0.0
  CBMH04               STORAGE           94.98      3.17       0.0
  CBMH05               STORAGE           95.23      3.07       0.0
  CBMH06               STORAGE           95.34      3.01       0.0
  CBMH07               STORAGE           94.92      3.03       0.0
  CBMH08               STORAGE           94.95      2.90       0.0
  CBMH09               STORAGE           94.83      2.97       0.0
  CBMH10               STORAGE           95.02      2.83       0.0
  CBMH11               STORAGE           95.21      2.59       0.0
  CBMH12               STORAGE           94.81      3.02       0.0
  CBMH13               STORAGE           94.82      3.01       0.0
  CBMH14               STORAGE           95.18      3.07       0.0
  CBMH15               STORAGE           95.60      2.70       0.0
  CBMH16               STORAGE           95.50      2.95       0.0
  MH200                STORAGE           95.12      2.48       0.0
  MH202                STORAGE           94.93      2.64       0.0
  MH204                STORAGE           94.69      2.73       0.0
  MH206                STORAGE           94.53      2.73       0.0
  MH208                STORAGE           94.39      2.64       0.0
  MH210                STORAGE           94.26      2.83       0.0
  MH212                STORAGE           94.14      2.80       0.0
  MH214                STORAGE           94.10      2.81       0.0
  MH218                STORAGE           95.20      2.34       0.0
  MH220                STORAGE           94.71      2.45       0.0
  MH222                STORAGE           94.73      2.39       0.0
  MH224                STORAGE           94.61      2.36       0.0
  MH230                STORAGE           94.93      2.10       0.0
  RYE01                STORAGE           95.48      2.97       0.0
  RYE02                STORAGE           95.62      2.58       0.0
  RYE03                STORAGE           95.78      2.92       0.0
  RYE04                STORAGE           95.37      2.93       0.0
  RYE05                STORAGE           95.62      2.73       0.0
  RYE06                STORAGE           95.45      2.60       0.0
  RYE07                STORAGE           95.02      2.83       0.0
  RYE08                STORAGE           95.25      2.60       0.0
  RYE09                STORAGE           95.25      2.60       0.0
  RYE10                STORAGE           95.68      2.32       0.0
  RYE11                STORAGE           94.86      2.94       0.0
  RYE12                STORAGE           95.55      2.70       0.0
  RYT01                STORAGE           95.36      2.94       0.0
  RYT02                STORAGE           95.53      2.72       0.0
  RYT03                STORAGE           95.22      3.03       0.0
  RYT04                STORAGE           95.42      2.73       0.0
  RYT05                STORAGE           95.14      2.91       0.0
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RYT06	STORAGE	94.86	2.99	0.0
RYT07	STORAGE	94.67	3.03	0.0
RYT08	STORAGE	95.16	3.04	0.0
RYT09	STORAGE	95.70	2.85	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
CBMH16-MH218	CBMH16-Dummy	MH218	CONDUIT	39.6	0.4546	0.0130
Dummy-CBMH09	CBMH09-Dummy	CBMH09	CONDUIT	14.0	0.1429	0.0130
MH200-MH202	MH200	MH202	CONDUIT	48.0	0.2500	0.0130
MH202-MH204	MH202	MH204	CONDUIT	81.9	0.2076	0.0130
MH204-MH206	MH204	MH206	CONDUIT	41.5	0.2169	0.0130
MH206-MH208	MH206	MH208	CONDUIT	41.4	0.1691	0.0130
MH208-MH210	MH208	MH210	CONDUIT	39.4	0.1523	0.0130
MH210-MH212	MH210	MH212	CONDUIT	43.5	0.1149	0.0130
MH212-MH214	MH212	MH214	CONDUIT	37.4	0.1070	0.0130
MH214-MH1013	MH214	MH1013	CONDUIT	18.0	0.1111	0.0130
MH218-MH200	MH218	MH200	CONDUIT	7.1	0.2817	0.0130
MH220-MH210	MH220	MH210	CONDUIT	30.9	0.2589	0.0130
MH222-MH224	MH222	MH224	CONDUIT	17.1	0.2924	0.0130
MH224-MH212	MH224	MH212	CONDUIT	44.9	0.2004	0.0130
MH230-MH222	MH230	MH222	CONDUIT	17.0	0.4706	0.0130
MS-CB01	CB01	HP-CB01	CONDUIT	3.0	1.0001	0.0150
MS-CBMH01(1)	CBMH01	HP-CBMH01	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH01(2)	HP-CBMH01	CBMH11	CONDUIT	3.0	11.7469	0.0150
MS-CBMH02(1)	CBMH02	HP-CBMH02	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH02(2)	HP-CBMH02	CB01	CONDUIT	3.0	4.0032	0.0150
MS-CBMH03(1)	CBMH03	HP-CBMH03	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH03(2)	HP-CBMH03	CBMH12	CONDUIT	3.0	10.7279	0.0150
MS-CBMH04(1)	CBMH04	HP-CBMH04	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH04(2)	HP-CBMH04	CBMH07	CONDUIT	3.0	16.9031	0.0150
MS-CBMH05(1)	CBMH05	HP-CBMH05	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH05(2)	HP-CBMH05	CBMH15	CONDUIT	3.0	10.0504	0.0150
MS-CBMH06(1)	CBMH06	HP-CBMH06	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH06(2)	HP-CBMH06	CBMH15	CONDUIT	3.0	11.7469	0.0150
MS-CBMH07(1)	CBMH07	HP-CBMH07	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH07(2)	HP-CBMH07	CBMH13	CONDUIT	3.0	14.1393	0.0150
MS-CBMH08(1)	CBMH08	HP-CBMH08	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH08(2)	HP-CBMH08	CBMH09	CONDUIT	3.0	11.7469	0.0150
MS-CBMH09(1)	CBMH09	HP-CBMH09	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH09(2)	HP-CBMH09	CBMH02	CONDUIT	3.0	13.4535	0.0150
MS-CBMH10(1)	CBMH10	HP-CBMH10	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH10(2)	HP-CBMH10	CBMH09	CONDUIT	3.0	11.7469	0.0150
MS-CBMH11(1)	CBMH11	HP-CBMH11	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH11(2)	HP-CBMH11	CBMH02	CONDUIT	3.0	13.4535	0.0150
MS-CBMH12(1)	CBMH12	HP-CBMH12	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH12(2)	HP-CBMH12	CBMH11	CONDUIT	3.0	11.0672	0.0150
MS-CBMH13(1)	CBMH13	HP-CBMH13	CONDUIT	3.0	-4.3374	0.0150
MS-CBMH13(2)	HP-CBMH13	CBMH12	CONDUIT	3.0	4.3374	0.0150
MS-CBMH14(1)	CBMH14	HP-CBMH14	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH14(2)	HP-CBMH14	CBMH07	CONDUIT	3.0	20.4124	0.0150
MS-CBMH15(1)	CBMH15	HP-CBMH15	CONDUIT	3.0	-10.0504	0.0150
MS-CBMH15(2)	HP-CBMH15	CBMH14	CONDUIT	3.0	11.7469	0.0150
MS-CBMH16	CBMH16	HP-CBMH16	CONDUIT	8.7	-0.5758	0.0350
MS-HP01(1)	HP01	RYT01	CONDUIT	24.5	1.6322	0.0350
MS-HP01(2)	HP01	RYE05	CONDUIT	23.5	1.4905	0.0100
MS-HP02(1)	HP02	RYT04	CONDUIT	15.9	3.4695	0.0350
MS-HP02(2)	HP02	RYE05	CONDUIT	24.1	1.4541	0.0350
MS-HP03	HP03	RYT01	CONDUIT	25.1	1.5960	0.0350
MS-RYE01	RYE01	HP-RYE01	CONDUIT	7.7	-1.9373	0.0350
MS-RYE02	RYE02	HP-RYE02	CONDUIT	7.8	-1.9254	0.0350
MS-RYE03(1)	RYE03	HP-RYE03	CONDUIT	3.0	-8.3624	0.0350
MS-RYE03(2)	HP-RYE03	CBMH06	CONDUIT	3.0	20.4124	0.0150
MS-RYE04(1)	RYE04	HP-RYE04	CONDUIT	3.0	-10.0504	0.0150
MS-RYE04(2)	HP-RYE04	CBMH07	CONDUIT	62.3	1.0432	0.0150
MS-RYE05(1)	RYE05	HP-RYE05	CONDUIT	4.0	-6.2434	0.0350
MS-RYE05(2)	HP-RYE05	CBMH05	CONDUIT	3.0	10.0504	0.0150
MS-RYE06(1)	RYE06	HP-RYE06	CONDUIT	16.1	-1.5572	0.0350
MS-RYE06(2)	HP-RYE06	RYT06	CONDUIT	24.9	1.8043	0.0350
MS-RYE07(1)	RYE07	HP-RYE07	CONDUIT	3.0	-11.7469	0.0350
MS-RYE07(2)	HP-RYE07	CBMH01	CONDUIT	3.0	11.7469	0.0150
MS-RYE08(1)	RYE08	HP-RYE08	CONDUIT	15.0	-1.4668	0.0350
MS-RYE08(2)	HP-RYE08	RYT07	CONDUIT	23.6	1.5671	0.0350
MS-RYE09(1)	RYE09	HP-RYE09	CONDUIT	15.0	-1.6669	0.0350
MS-RYE09(2)	HP-RYE09	RYT07	CONDUIT	24.0	1.6669	0.0350
MS-RYE10(1)	RYE10	RYT08	CONDUIT	29.1	-0.6877	0.0350
MS-RYE10(2)	RYT08	CBMH08	CONDUIT	3.0	11.7469	0.0150
MS-RYE11(1)	RYE11	HP-RYE11	CONDUIT	8.4	-3.5870	0.0350
MS-RYE11(2)	HP-RYE11	CBMH09	CONDUIT	3.0	10.0504	0.0150
MS-RYE12(1)	RYE12	HP-RYE12	CONDUIT	3.0	-6.6815	0.0350
MS-RYE12(2)	HP-RYE12	RYT03	CONDUIT	3.0	6.6815	0.0350
MS-RYT01(1)	RYT01	HP-RYT01	CONDUIT	4.4	-7.9798	0.0350
MS-RYT01(2)	HP-RYT01	CBMH06	CONDUIT	3.0	10.0504	0.0150
MS-RYT01(3)	HP03	RYE01	CONDUIT	15.2	1.6481	0.0350
MS-RYT02(1)	RYT02	HP-RYT02	CONDUIT	3.0	-7.6893	0.0350
MS-RYT02(2)	HP-RYT02	CBMH15	CONDUIT	3.0	6.0108	0.0350
MS-RYT03(1)	RYT03	HP-RYT03	CONDUIT	3.0	-5.0063	0.0350
MS-RYT03(2)	HP-RYT03	CBMH14	CONDUIT	3.0	5.0063	0.0350
MS-RYT04(1)	RYT04	HP-RYT04	CONDUIT	19.4	-1.5438	0.0350
MS-RYT04(2)	HP-RYT04	RYT05	CONDUIT	25.4	1.5726	0.0350
MS-RYT05(1)	RYT05	HP-RYT05	CONDUIT	23.9	-1.4675	0.0350
MS-RYT05(2)	HP-RYT05	RYE06	CONDUIT	19.6	1.7830	0.0350
MS-RYT06(1)	RYT06	HP-RT06	CONDUIT	23.9	-1.4674	0.0350
MS-RYT06(2)	HP-RT06	RYE08	CONDUIT	21.2	1.6489	0.0350
MS-RYT07(1)	RYT07	HP-RYT07	CONDUIT	4.4	-8.0036	0.0350
MS-RYT07(2)	HP-RYT07	CBMH02	CONDUIT	3.0	11.7469	0.0150
MS-RYT09(1)	RYT09	HP-RYT09	CONDUIT	3.0	-5.0063	0.0350
MS-RYT09(2)	HP-RYT09	RYT02	CONDUIT	3.0	15.1717	0.0350
RYE01-RYT01-Dummy	RYE01	RYT01-Dummy	CONDUIT	17.0	0.5294	0.0130
RYE02-CBMH16	RYE02	CBMH16	CONDUIT	12.1	0.4959	0.0130
RYE03-RYT09	RYE03	RYT09	CONDUIT	16.5	0.4849	0.0130
RYE04-RYT03(1)	RYE04	RYT03-Dummy	CONDUIT	15.0	0.4667	0.0130
RYE04-RYT03(2)	RYT03-Dummy	RYT03	CONDUIT	15.9	0.1258	0.0130
RYE05-RYT04	RYE05	RYT04	CONDUIT	38.6	0.5181	0.0130
RYE06-RYT06	RYE06	RYT06	CONDUIT	39.4	0.5076	0.0130
RYE07-CBMH01	RYE07	CBMH01	CONDUIT	25.4	0.5118	0.0130
RYE08-RYT07	RYE08	RYT07	CONDUIT	37.9	0.5013	0.0130
RYE09-RYT02	RYT09	RYT02	CONDUIT	32.5	0.5231	0.0130
RYE09-RYT07	RYE09	RYT07	CONDUIT	38.4	0.4948	0.0130
RYE10-RYT08	RYE10	RYT08	CONDUIT	28.0	0.5000	0.0130
RYE11-CBMH09	RYE11	CBMH09	CONDUIT	14.3	0.2098	0.0130
RYE12-RYT03	RYE12	RYT03	CONDUIT	11.6	0.5172	0.0130
RYT01-CBMH06	RYT01	CBMH06	CONDUIT	16.5	0.1212	0.0130
RYT01-Dummy-RYT01	RYT01-Dummy	RYT01	CONDUIT	22.1	0.0905	0.0130
RYT02-RYT03	RYT02	RYT03	CONDUIT	43.6	0.5046	0.0130
RYT03-CBMH14	RYT03	CBMH14	CONDUIT	6.9	0.1449	0.0130
RYT04-RYT05	RYT04	RYT05	CONDUIT	43.3	0.5081	0.0130
RYT05-CBMH04	RYT05	CBMH04	CONDUIT	21.8	0.5046	0.0130
RYT06-CBMH03	RYT06	CBMH03	CONDUIT	20.8	0.1442	0.0130
RYT07-CBMH02	RYT07	CBMH02	CONDUIT	20.8	0.1442	0.0130
RYT08-CBMH08	RYT08	CBMH08	CONDUIT	14.8	1.0136	0.0130
O-CBMH01	CBMH01	MH220	ORIFICE			
O-CBMH02	CBMH02	MH212	ORIFICE			
O-CBMH03	CBMH03	MH208	ORIFICE			
O-CBMH04	CBMH04	MH204	ORIFICE			
O-CBMH05	CBMH05	MH202	ORIFICE			
O-CBMH06	CBMH06	MH218	ORIFICE			
O-CBMH07	CBMH07	MH206	ORIFICE			
O-CBMH08	CBMH08	MH222	ORIFICE			
O-CBMH09	CBMH09	MH224	ORIFICE			
O-CBMH10	CBMH10	MH230	ORIFICE			
O-CBMH11	CBMH11	MH220	ORIFICE			
O-CBMH12	CBMH12	MH208	ORIFICE			
O-CBMH13	CBMH13	MH206	ORIFICE			
O-CBMH14	CBMH14	MH202	ORIFICE			
O-CBMH15	CBMH15	MH200	ORIFICE			
O-CBMH16	CBMH16	CBMH16-Dummy	ORIFICE			
O-CB01	CB01	MH214	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
CBMH16-MH218	CIRCULAR	0.25	0.05	0.06	0.25	1	40.10
Dummy-CBMH09	CIRCULAR	0.60	0.28	0.15	0.60	1	232.09
MH200-MH202	CIRCULAR	0.38	0.11	0.09	0.38	1	87.67
MH202-MH204	CIRCULAR	0.45	0.16	0.11	0.45	1	129.90
MH204-MH206	CIRCULAR	0.53	0.22	0.13	0.53	1	200.29
MH206-MH208	CIRCULAR	0.60	0.28	0.15	0.60	1	252.49
MH208-MH210	CIRCULAR	0.68	0.36	0.17	0.68	1	328.05
MH210-MH212	CIRCULAR	0.75	0.44	0.19	0.75	1	377.46
MH212-MH214	CIRCULAR	0.82	0.53	0.21	0.82	1	469.47
MH214-MH1013	CIRCULAR	0.82	0.53	0.21	0.82	1	478.51
MH218-MH200	CIRCULAR	0.38	0.11	0.09	0.38	1	93.06
MH220-MH210	CIRCULAR	0.38	0.11	0.09	0.38	1	89.22
MH222-MH224	CIRCULAR	0.38	0.11	0.09	0.38	1	94.81
MH224-MH212	CIRCULAR	0.45	0.16	0.11	0.45	1	127.65

MH230-MH222	CIRCULAR	0.25	0.05	0.06	0.25	1	40.80
MS-CB01	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
MS-CBMH01(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH01(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH02(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH02(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	28468.25
MS-CBMH03(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH03(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	46602.99
MS-CBMH04(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH04(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	58497.86
MS-CBMH05(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH05(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH06(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH06(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH07(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH07(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	53502.02
MS-CBMH08(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH08(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH09(1)	CIRCULAR	1.00	0.79	0.25	1.00	1	6587.83
MS-CBMH09(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
MS-CBMH10(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH10(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH11(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH11(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
MS-CBMH12(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH12(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	47334.20
MS-CBMH13(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
MS-CBMH13(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
MS-CBMH14(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH14(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	64284.19
MS-CBMH15(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CBMH15(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-CBMH16	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	4496.13
MS-HP01(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7570.03
MS-HP01(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	25319.22
MS-HP02(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	11036.80
MS-HP02(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7145.00
MS-HP03	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7485.58
MS-RYE01	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	8247.34
MS-RYE02	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	8221.89
MS-RYE03(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	17134.69
MS-RYE03(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	64284.19
MS-RYE04(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYE04(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	14532.59
MS-RYE05(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	14805.47
MS-RYE05(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYE06(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7394.14
MS-RYE06(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7959.03
MS-RYE07(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	20308.20
MS-RYE07(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-RYE08(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7176.28
MS-RYE08(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7417.58
MS-RYE09(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7650.06
MS-RYE09(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7650.06
MS-RYE10(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	4913.64
MS-RYE10(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-RYE11(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	11222.09
MS-RYE11(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYE12(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	15316.10
MS-RYE12(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	15316.10
MS-RYT01(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	16738.13
MS-RYT01(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-RYT01(3)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7606.81
MS-RYT02(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	16430.60
MS-RYT02(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	14527.05
MS-RYT03(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	13257.66
MS-RYT03(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	13257.66
MS-RYT04(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7362.15
MS-RYT04(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7430.48
MS-RYT05(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7177.88
MS-RYT05(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7911.98
MS-RYT06(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7177.58
MS-RYT06(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	7608.67
MS-RYT07(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	16763.07
MS-RYT07(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
MS-RYT09(1)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	13257.66
MS-RYT09(2)	TRAPEZOIDAL	1.00	3.30	0.50	6.30	1	23079.51
RYE01-RYT01-Dummy	CIRCULAR	0.25	0.05	0.06	0.25	1	43.27
RYE02-CBMH16	CIRCULAR	0.25	0.05	0.06	0.25	1	41.88
RYE03-RYT09	CIRCULAR	0.25	0.05	0.06	0.25	1	41.41
RYE04-RYT03(1)	CIRCULAR	0.25	0.05	0.06	0.25	1	40.63
RYE04-RYT03(2)	CIRCULAR	0.60	0.28	0.15	0.60	1	217.78
RYE05-RYT04	CIRCULAR	0.25	0.05	0.06	0.25	1	42.81
RYE06-RYT06	CIRCULAR	0.25	0.05	0.06	0.25	1	42.37
RYE07-CBMH01	CIRCULAR	0.25	0.05	0.06	0.25	1	42.55
RYE08-RYT07	CIRCULAR	0.25	0.05	0.06	0.25	1	42.11
RYE09-RYT02	CIRCULAR	0.25	0.05	0.06	0.25	1	43.01
RYE09-RYT07	CIRCULAR	0.25	0.05	0.06	0.25	1	41.83
RYE10-RYT08	CIRCULAR	0.25	0.05	0.06	0.25	1	42.05
RYE11-CBMH09	CIRCULAR	0.60	0.28	0.15	0.60	1	281.25
RYE12-RYT03	CIRCULAR	0.25	0.05	0.06	0.25	1	42.77
RYT01-CBMH06	CIRCULAR	0.60	0.28	0.15	0.60	1	213.78
RYT01-Dummy-RYT01	CIRCULAR	0.60	0.28	0.15	0.60	1	184.72
RYT02-RYT03	CIRCULAR	0.25	0.05	0.06	0.25	1	42.25
RYT03-CBMH14	CIRCULAR	0.60	0.28	0.15	0.60	1	233.76
RYT04-RYT05	CIRCULAR	0.25	0.05	0.06	0.25	1	42.39
RYT05-CBMH04	CIRCULAR	0.25	0.05	0.06	0.25	1	42.25
RYT06-CBMH03	CIRCULAR	0.60	0.28	0.15	0.60	1	233.20
RYT07-CBMH02	CIRCULAR	0.75	0.44	0.19	0.75	1	422.82
RYT08-CBMH08	CIRCULAR	0.25	0.05	0.06	0.25	1	59.87

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**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 05/19/2021 00:00:00
Ending Date ..... 05/20/2021 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 4
Head Tolerance ..... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation .....          0.382       103.232
Evaporation Loss .....             0.000         0.000
Infiltration Loss .....            0.092        24.933
Surface Runoff .....               0.288        77.848
Final Storage .....                0.003         0.804
Continuity Error (%) .....       -0.342


**************************        Volume         Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .....           0.000         0.000
Wet Weather Inflow .....           0.288         2.880
Groundwater Inflow .....           0.000         0.000
RDII Inflow .....                  0.000         0.000
External Inflow .....             0.000         0.001
External Outflow .....            0.288         2.876
Flooding Loss .....                0.000         0.000
Evaporation Loss .....             0.000         0.000
Exfiltration Loss .....            0.000         0.000
Initial Stored Volume ....         0.012         0.120
Final Stored Volume .....          0.012         0.122
Continuity Error (%) .....        0.068
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**************************
Highest Continuity Errors
**************************
Node RYT03-Dummy (3.30%)
Node RYT01-Dummy (-2.55%)
Node RYE12 (1.00%)


***************************
Time-Step Critical Elements
***************************
Link MH208-MH210 (11.56%)
Link MS-RYT02(2) (5.34%)
Link RYT03-CBMH14 (4.46%)
Link MS-CBMH13(1) (2.44%)
Link MH218-MH200 (1.81%)


*******************************
Highest Flow Instability Indexes
*******************************
Link MS-RYT03(1) (13)
Link MS-RYT03(2) (13)
Link RYT03-CBMH14 (12)
Link RYE04-RYT03(2) (10)
Link RYT02-RYT03 (8)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.57 sec
Average Time Step           :     4.53 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.25
Percent Not Converging      :     0.02
Time Step Frequencies       :
    5.000 -  3.155 sec      :    86.32 %
    3.155 -  1.991 sec      :    10.05 %
    1.991 -  1.256 sec      :     3.26 %
    1.256 -  0.792 sec      :     0.27 %
    0.792 -  0.500 sec      :     0.09 %


****************************
Subcatchment Runoff Summary
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Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Peak Runoff 10^6 ltr	Runoff Coeff LPS
A01	103.23	0.00	0.00	41.58	46.97	14.72	61.68	0.02	12.72	0.598
A02	103.23	0.00	0.00	19.46	76.37	7.24	83.61	0.03	13.64	0.810
A03	103.23	0.00	0.00	37.15	52.83	13.25	66.08	0.05	25.90	0.640
A04	103.23	0.00	0.00	10.82	87.41	4.03	91.44	0.19	72.54	0.886
A05	103.23	0.00	0.00	12.95	84.61	4.80	89.42	0.08	30.98	0.866
A06	103.23	0.00	0.00	7.55	91.85	2.84	94.69	0.11	41.66	0.917
A07	103.23	0.00	0.00	42.10	46.53	14.12	60.65	0.11	53.67	0.587
A08	103.23	0.00	0.00	44.93	42.54	15.81	58.35	0.04	21.92	0.565
A09	103.23	0.00	0.00	9.75	88.89	3.66	92.54	0.12	44.99	0.896
A10	103.23	0.00	0.00	36.12	54.47	12.70	67.17	0.13	60.88	0.651
A11	103.23	0.00	0.00	9.75	89.16	3.66	92.82	0.11	41.53	0.899
A12	103.23	0.00	0.00	15.24	81.92	5.51	87.43	0.28	109.13	0.847
A13	103.23	0.00	0.00	20.57	74.61	7.57	82.18	0.10	40.76	0.796
A14	103.23	0.00	0.00	35.03	55.91	12.35	68.26	0.10	48.30	0.661
A15	103.23	0.00	0.00	9.75	89.23	3.66	92.88	0.11	41.53	0.900
A16	103.23	0.00	0.00	19.46	75.73	7.24	82.97	0.07	27.28	0.804
A17	103.23	0.00	0.00	59.29	25.03	19.04	44.07	0.05	30.56	0.427
A18	103.23	0.00	0.00	14.12	83.09	5.19	88.28	0.11	44.61	0.855
A19	103.23	0.00	0.00	10.85	87.42	4.00	91.42	0.13	48.31	0.886
A20	103.23	0.00	0.00	36.12	54.47	12.70	67.17	0.11	54.47	0.651
A21	103.23	0.00	0.00	10.82	87.61	4.03	91.64	0.23	86.36	0.888
A22	103.23	0.00	0.00	43.56	44.15	15.67	59.82	0.03	16.08	0.579
A23	103.23	0.00	0.00	17.36	79.03	6.42	85.46	0.12	47.86	0.828
A24	103.23	0.00	0.00	22.79	71.53	8.35	79.88	0.12	50.71	0.774
A25	103.23	0.00	0.00	56.15	27.91	19.38	47.29	0.04	26.50	0.458
A26	103.23	0.00	0.00	17.39	78.63	6.38	85.01	0.15	61.43	0.824
A27	103.23	0.00	0.00	21.72	73.30	7.97	81.27	0.06	23.72	0.787
U01	103.23	0.00	0.00	52.96	30.92	19.75	50.67	0.01	6.49	0.491
U02	103.23	0.00	0.00	75.37	0.00	28.43	28.43	0.01	12.56	0.275
U03	103.23	0.00	0.00	75.37	0.00	28.43	28.43	0.02	18.84	0.275
U04	103.23	0.00	0.00	11.86	86.79	4.45	91.25	0.01	3.45	0.884
U05	103.23	0.00	0.00	69.28	8.74	25.64	34.38	0.01	6.30	0.333

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.00	0.02	96.90	0 12:00	0.02
CBMH09-Dummy	JUNCTION	0.44	2.13	96.98	0 12:06	2.13
CBMH16-Dummy	JUNCTION	0.02	0.15	95.65	0 12:00	0.15
HP01	JUNCTION	0.00	0.00	97.70	0 00:00	0.00
HP02	JUNCTION	0.00	0.00	97.70	0 00:00	0.00
HP03	JUNCTION	0.00	0.00	97.70	0 00:00	0.00
HP-CBMH01	JUNCTION	0.00	0.00	97.15	0 00:00	0.00
HP-CBMH02	JUNCTION	0.00	0.00	97.00	0 00:00	0.00
HP-CBMH03	JUNCTION	0.00	0.00	97.15	0 00:00	0.00
HP-CBMH04	JUNCTION	0.00	0.00	97.45	0 00:00	0.00
HP-CBMH05	JUNCTION	0.00	0.00	97.60	0 00:00	0.00
HP-CBMH06	JUNCTION	0.00	0.00	97.65	0 00:00	0.00
HP-CBMH07	JUNCTION	0.00	0.00	97.25	0 00:00	0.00
HP-CBMH08	JUNCTION	0.00	0.00	97.15	0 12:04	0.00
HP-CBMH09	JUNCTION	0.00	0.00	97.10	0 00:00	0.00
HP-CBMH10	JUNCTION	0.00	0.00	97.15	0 00:00	0.00
HP-CBMH11	JUNCTION	0.00	0.00	97.10	0 00:00	0.00
HP-CBMH12	JUNCTION	0.00	0.00	97.13	0 00:00	0.00
HP-CBMH13	JUNCTION	0.00	0.09	97.05	0 12:04	0.09
HP-CBMH14	JUNCTION	0.00	0.00	97.55	0 00:00	0.00
HP-CBMH15	JUNCTION	0.00	0.00	97.60	0 00:00	0.00
HP-RT06	JUNCTION	0.00	0.00	97.20	0 00:00	0.00
HP-RYE03	JUNCTION	0.00	0.00	97.95	0 00:00	0.00
HP-RYE04	JUNCTION	0.00	0.00	97.60	0 00:00	0.00
HP-RYE05	JUNCTION	0.00	0.00	97.60	0 00:00	0.00
HP-RYE06	JUNCTION	0.00	0.01	97.31	0 12:01	0.01
HP-RYE07	JUNCTION	0.00	0.00	97.20	0 00:00	0.00
HP-RYE08	JUNCTION	0.00	0.05	97.12	0 12:00	0.05
HP-RYE09	JUNCTION	0.00	0.00	97.10	0 00:00	0.00

HP-RYE11	JUNCTION	0.00	0.00	97.10	0	00:00	0.00	
HP-RYE12	JUNCTION	0.01	0.09	97.54	0	12:08	0.09	
HP-RYT01	JUNCTION	0.00	0.00	97.65	0	00:00	0.00	
HP-RYT02	JUNCTION	0.00	0.04	97.52	0	12:22	0.04	
HP-RYT03	JUNCTION	0.02	0.14	97.54	0	12:09	0.14	
HP-RYT04	JUNCTION	0.00	0.00	97.45	0	00:00	0.00	
HP-RYT05	JUNCTION	0.00	0.04	97.44	0	12:02	0.04	
HP-RYT07	JUNCTION	0.00	0.00	97.05	0	00:00	0.00	
HP-RYT09	JUNCTION	0.00	0.00	97.70	0	00:00	0.00	
RYT01-Dummy	JUNCTION	0.16	2.16	97.54	0	12:03	2.16	
RYT03-Dummy	JUNCTION	0.77	2.24	97.54	0	12:08	2.24	
HP-CB01	OUTFALL	0.00	0.02	96.87	0	12:00	0.02	
HP-CBMH16	OUTFALL	0.00	0.00	97.50	0	00:00	0.00	
HP-RYE01	OUTFALL	0.00	0.00	97.60	0	00:00	0.00	
HP-RYE02	OUTFALL	0.00	0.00	97.35	0	00:00	0.00	
MH1013	OUTFALL	0.97	0.97	95.05	0	00:00	0.97	
OF1	OUTFALL	0.00	0.00	97.40	0	00:00	0.00	
OF2	OUTFALL	0.00	0.00	98.20	0	00:00	0.00	
OF3	OUTFALL	0.00	0.00	97.40	0	00:00	0.00	
CBMH01	STORAGE	0.41	2.15	97.01	0	12:07	2.15	
CBMH02	STORAGE	0.66	2.31	96.95	0	12:07	2.31	
CBMH03	STORAGE	0.51	2.29	97.12	0	12:09	2.29	
CBMH04	STORAGE	0.50	2.44	97.42	0	12:10	2.44	
CBMH05	STORAGE	0.15	2.21	97.44	0	12:03	2.21	
CBMH06	STORAGE	0.19	2.20	97.54	0	12:04	2.20	
CBMH07	STORAGE	0.30	2.23	97.15	0	12:04	2.23	
CBMH08	STORAGE	0.43	2.20	97.15	0	12:04	2.20	
CBMH09	STORAGE	0.46	2.15	96.98	0	12:06	2.15	
CBMH10	STORAGE	0.15	2.09	97.11	0	12:03	2.09	
CBMH11	STORAGE	0.17	1.79	97.00	0	12:03	1.79	
CBMH12	STORAGE	0.52	2.24	97.05	0	12:04	2.24	
CBMH13	STORAGE	0.51	2.23	97.05	0	12:04	2.23	
CBMH14	STORAGE	0.86	2.36	97.54	0	12:09	2.36	
CBMH15	STORAGE	0.19	1.84	97.44	0	12:03	1.84	
CBMH16	STORAGE	0.05	1.26	96.76	0	12:00	1.25	
MH200	STORAGE	0.06	0.27	95.39	0	12:01	0.27	
MH202	STORAGE	0.14	0.35	95.28	0	12:02	0.35	
MH204	STORAGE	0.37	0.50	95.19	0	12:03	0.50	
MH206	STORAGE	0.53	0.63	95.16	0	12:03	0.63	
MH208	STORAGE	0.67	0.75	95.14	0	12:03	0.75	
MH210	STORAGE	0.80	0.86	95.12	0	12:03	0.86	
MH212	STORAGE	0.91	0.96	95.10	0	12:03	0.96	
MH214	STORAGE	0.95	0.98	95.08	0	12:03	0.98	
MH218	STORAGE	0.06	0.27	95.47	0	12:01	0.27	
MH220	STORAGE	0.35	0.43	95.14	0	12:03	0.43	
MH222	STORAGE	0.33	0.40	95.13	0	12:03	0.40	
MH224	STORAGE	0.45	0.51	95.12	0	12:03	0.51	
MH230	STORAGE	0.13	0.23	95.16	0	12:03	0.23	
RYE01	STORAGE	0.14	2.06	97.54	0	12:03	2.06	
RYE02	STORAGE	0.03	1.15	96.77	0	12:00	1.14	
RYE03	STORAGE	0.53	1.74	97.52	0	12:20	1.74	
RYE04	STORAGE	0.72	2.17	97.54	0	12:05	2.17	
RYE05	STORAGE	0.29	1.83	97.45	0	12:04	1.83	
RYE06	STORAGE	0.23	1.86	97.31	0	12:02	1.86	
RYE07	STORAGE	0.25	2.01	97.03	0	12:03	2.01	
RYE08	STORAGE	0.23	1.87	97.12	0	12:00	1.87	
RYE09	STORAGE	0.21	1.70	96.95	0	12:07	1.70	
RYE10	STORAGE	0.22	1.47	97.15	0	12:03	1.47	
RYE11	STORAGE	0.43	2.12	96.98	0	12:05	2.12	
RYE12	STORAGE	0.63	1.99	97.54	0	12:08	1.99	
RYT01	STORAGE	0.17	2.18	97.54	0	12:03	2.18	
RYT02	STORAGE	0.64	1.99	97.52	0	12:22	1.99	
RYT03	STORAGE	0.82	2.32	97.54	0	12:09	2.32	
RYT04	STORAGE	0.34	2.02	97.44	0	12:04	2.02	
RYT05	STORAGE	0.41	2.30	97.44	0	12:02	2.30	
RYT06	STORAGE	0.48	2.26	97.12	0	12:09	2.26	
RYT07	STORAGE	0.63	2.28	96.95	0	12:07	2.28	
RYT08	STORAGE	0.31	1.99	97.15	0	12:04	1.99	
RYT09	STORAGE	0.56	1.82	97.52	0	12:20	1.82	

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	23.72	23.72	0 12:00	0.0569	0.0569	0.014
CBMH09-Dummy	JUNCTION	0.00	39.30	0 00:00	0	0.00471	8.087
CBMH16-Dummy	JUNCTION	0.00	24.18	0 12:00	0	0.0581	0.609
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH02	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH04	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH08	JUNCTION	0.00	3.02	0 12:04	0	0.000411	0.056
HP-CBMH09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH10	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH13	JUNCTION	0.00	32.67	0 11:56	0	0.0214	-0.025
HP-CBMH14	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-CBMH15	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RT06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE04	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE06	JUNCTION	0.00	3.52	0 12:01	0	0.00014	2.533
HP-RYE07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE08	JUNCTION	0.00	10.72	0 12:00	0	0.00268	-1.344
HP-RYE09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE12	JUNCTION	0.00	18.90	0 12:00	0	0.00803	0.828
HP-RYT01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYT02	JUNCTION	0.00	9.65	0 12:22	0	0.0263	-0.041
HP-RYT03	JUNCTION	0.00	2.24	0 12:00	0	0.00338	6.005
HP-RYT04	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYT05	JUNCTION	0.00	8.36	0 12:00	0	0.00485	1.666
HP-RYT07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYT09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
RYT01-Dummy	JUNCTION	0.00	6.34	0 11:58	0	0.0112	-2.488
RYT03-Dummy	JUNCTION	0.00	20.64	0 12:00	0	0.0418	3.408
HP-CB01	OUTFALL	0.00	19.31	0 12:00	0	0.0433	0.000
HP-CBMH16	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE01	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RYE02	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
MH1013	OUTFALL	0.00	310.75	0 12:03	0	2.78	0.000
OF1	OUTFALL	12.56	12.56	0 12:00	0.0114	0.0114	0.000
OF2	OUTFALL	22.29	22.29	0 12:00	0.0262	0.0262	0.000
OF3	OUTFALL	12.78	12.78	0 12:00	0.017	0.017	0.000
CBMH01	STORAGE	44.61	62.14	0 12:00	0.115	0.168	0.040
CBMH02	STORAGE	86.36	125.69	0 11:59	0.229	0.348	0.071
CBMH03	STORAGE	41.53	73.27	0 12:00	0.111	0.219	0.062
CBMH04	STORAGE	41.53	71.62	0 11:58	0.111	0.237	0.048
CBMH05	STORAGE	41.66	41.66	0 12:00	0.114	0.114	0.066
CBMH06	STORAGE	72.54	98.18	0 11:56	0.192	0.252	0.020
CBMH07	STORAGE	109.13	109.13	0 12:00	0.28	0.28	0.025
CBMH08	STORAGE	47.86	59.35	0 12:00	0.12	0.153	0.070
CBMH09	STORAGE	61.43	86.82	0 11:59	0.153	0.203	0.104
CBMH10	STORAGE	50.71	50.71	0 12:00	0.12	0.12	0.063
CBMH11	STORAGE	48.31	48.31	0 12:00	0.128	0.128	0.074
CBMH12	STORAGE	27.28	59.65	0 11:56	0.0663	0.0815	0.057
CBMH13	STORAGE	40.76	40.76	0 12:00	0.0986	0.107	0.038
CBMH14	STORAGE	44.99	50.67	0 11:56	0.12	0.253	0.139
CBMH15	STORAGE	30.98	30.98	0 12:00	0.0804	0.107	-0.016
CBMH16	STORAGE	13.64	25.42	0 12:00	0.0334	0.0581	0.008
MH200	STORAGE	0.00	74.74	0 12:01	0	0.409	-0.025
MH202	STORAGE	0.00	101.06	0 12:01	0	0.766	-0.016
MH204	STORAGE	0.00	114.51	0 12:02	0	1	-0.001
MH206	STORAGE	0.00	160.70	0 12:03	0	1.37	-0.000
MH208	STORAGE	0.00	186.59	0 12:03	0	1.66	-0.000
MH210	STORAGE	0.00	224.63	0 12:03	0	1.96	0.000
MH212	STORAGE	0.00	309.80	0 12:03	0	2.77	-0.000
MH214	STORAGE	0.00	310.74	0 12:03	0	2.78	-0.000
MH218	STORAGE	0.00	59.64	0 12:01	0	0.302	-0.069
MH220	STORAGE	0.00	37.97	0 12:04	0	0.296	-0.001
MH222	STORAGE	0.00	33.33	0 12:04	0	0.269	-0.002
MH224	STORAGE	0.00	53.29	0 12:05	0	0.466	-0.000
MH230	STORAGE	0.00	22.46	0 12:03	0	0.12	0.000
RYE01	STORAGE	0.00	6.23	0 11:58	0	0.00362	0.543
RYE02	STORAGE	12.72	12.72	0 12:00	0.0247	0.0247	0.008
RYE03	STORAGE	0.00	3.49	0 11:50	0	0.00265	-0.001
RYE04	STORAGE	21.92	21.92	0 12:00	0.0409	0.041	0.485
RYE05	STORAGE	0.00	8.25	0 11:50	0	0.00592	0.044
RYE06	STORAGE	48.30	50.81	0 12:00	0.102	0.107	0.059

RYE07	STORAGE	30.56	30.56	0	12:00	0.053	0.0532	0.080
RYE08	STORAGE	54.47	54.47	0	12:00	0.114	0.114	0.053
RYE09	STORAGE	0.00	8.58	0	11:50	0	0.00511	0.067
RYE10	STORAGE	16.08	16.08	0	12:00	0.0299	0.0302	0.114
RYE11	STORAGE	26.50	26.50	0	12:00	0.0426	0.0449	0.077
RYE12	STORAGE	0.00	29.02	0	12:00	0	0.0171	1.014
RYT01	STORAGE	25.90	57.15	0	11:54	0.0529	0.0674	0.172
RYT02	STORAGE	0.00	23.13	0	11:49	0	0.0688	0.126
RYT03	STORAGE	53.67	74.59	0	12:00	0.109	0.21	-0.465
RYT04	STORAGE	0.00	23.66	0	11:50	0	0.0268	0.058
RYT05	STORAGE	60.88	60.88	0	12:00	0.128	0.151	0.037
RYT06	STORAGE	0.00	40.19	0	12:01	0	0.107	-0.051
RYT07	STORAGE	0.00	48.34	0	12:00	0	0.124	0.088
RYT08	STORAGE	0.00	12.95	0	11:51	0	0.0329	-0.068
RYT09	STORAGE	0.00	11.58	0	11:50	0	0.0117	0.012

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH09-Dummy	JUNCTION	1.61	1.533	1.017
RYT01-Dummy	JUNCTION	0.87	1.561	1.099
RYT03-Dummy	JUNCTION	7.46	1.636	0.164

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CBMH01	0.002	2	0	0	0.028	30	0 12:07	26.01
CBMH02	0.004	5	0	0	0.058	69	0 12:07	43.43
CBMH03	0.003	6	0	0	0.039	79	0 12:09	19.18
CBMH04	0.004	8	0	0	0.039	80	0 12:10	28.90
CBMH05	0.001	1	0	0	0.016	25	0 12:03	19.97
CBMH06	0.001	2	0	0	0.028	49	0 12:04	67.79
CBMH07	0.003	4	0	0	0.037	54	0 12:04	38.89
CBMH08	0.004	10	0	0	0.037	98	0 12:04	17.01
CBMH09	0.003	3	0	0	0.043	37	0 12:06	39.30
CBMH10	0.001	4	0	0	0.022	83	0 12:03	22.46
CBMH11	0.001	3	0	0	0.024	51	0 12:03	17.96
CBMH12	0.003	6	0	0	0.027	57	0 12:04	15.51
CBMH13	0.003	10	0	0	0.021	67	0 12:04	39.83
CBMH14	0.005	16	0	0	0.030	89	0 12:09	21.40
CBMH15	0.000	1	0	0	0.010	25	0 12:03	15.19
CBMH16	0.000	2	0	0	0.001	43	0 12:00	24.18
MH200	0.000	2	0	0	0.000	11	0 12:01	74.66
MH202	0.000	5	0	0	0.000	13	0 12:02	100.75
MH204	0.000	14	0	0	0.001	18	0 12:03	114.54
MH206	0.001	19	0	0	0.001	23	0 12:03	160.76
MH208	0.001	25	0	0	0.001	28	0 12:03	186.65
MH210	0.001	28	0	0	0.001	30	0 12:03	224.70
MH212	0.001	33	0	0	0.001	34	0 12:03	309.84
MH214	0.001	34	0	0	0.001	35	0 12:03	310.75
MH218	0.000	2	0	0	0.000	12	0 12:01	59.57
MH220	0.000	14	0	0	0.000	18	0 12:03	38.03
MH222	0.000	14	0	0	0.000	17	0 12:03	33.34
MH224	0.001	19	0	0	0.001	22	0 12:03	53.34
MH230	0.000	6	0	0	0.000	11	0 12:03	22.46
RYE01	0.000	5	0	0	0.001	69	0 12:03	3.90
RYE02	0.000	1	0	0	0.000	45	0 12:00	11.80
RYE03	0.000	4	0	0	0.001	13	0 12:20	1.09
RYE04	0.000	25	0	0	0.001	74	0 12:05	20.64
RYE05	0.000	11	0	0	0.001	67	0 12:04	3.00
RYE06	0.000	9	0	0	0.001	71	0 12:02	43.55
RYE07	0.001	3	0	0	0.009	45	0 12:03	18.73
RYE08	0.000	9	0	0	0.001	72	0 12:00	50.09
RYE09	0.000	8	0	0	0.001	66	0 12:07	5.44
RYE10	0.000	9	0	0	0.001	64	0 12:03	12.95
RYE11	0.000	15	0	0	0.001	72	0 12:05	25.42
RYE12	0.002	15	0	0	0.014	89	0 12:08	1.73
RYT01	0.000	6	0	0	0.001	74	0 12:03	27.19
RYT02	0.004	10	0	0	0.021	58	0 12:22	11.58
RYT03	0.003	15	0	0	0.014	89	0 12:09	53.65
RYT04	0.000	12	0	0	0.001	74	0 12:04	8.25
RYT05	0.000	14	0	0	0.001	79	0 12:02	50.19
RYT06	0.000	16	0	0	0.001	76	0 12:09	33.74
RYT07	0.000	21	0	0	0.001	75	0 12:07	42.14
RYT08	0.000	10	0	0	0.001	66	0 12:04	11.86
RYT09	0.000	7	0	0	0.001	23	0 12:20	3.49

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
HP-CB01	99.24	0.79	19.31	0.043
HP-CBMH16	0.00	0.00	0.00	0.000
HP-RYE01	0.00	0.00	0.00	0.000
HP-RYE02	0.00	0.00	0.00	0.000
MH1013	99.98	47.68	310.75	2.779
OF1	6.79	3.90	12.56	0.011
OF2	92.26	0.60	22.29	0.026
OF3	76.93	0.45	12.78	0.017
System	46.90	53.42	376.02	2.877

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
CBMH16-MH218	CONDUIT	24.17	0 12:00	0.78	0.60	0.60
Dummy-CBMH09	CONDUIT	39.30	0 00:00	0.69	0.17	1.00
MH200-MH202	CONDUIT	74.66	0 12:01	0.88	0.85	0.72
MH202-MH204	CONDUIT	100.75	0 12:02	0.69	0.78	0.86
MH204-MH206	CONDUIT	114.54	0 12:03	0.53	0.57	0.98
MH206-MH208	CONDUIT	160.76	0 12:03	0.57	0.64	1.00
MH208-MH210	CONDUIT	186.65	0 12:03	0.52	0.57	1.00
MH210-MH212	CONDUIT	224.70	0 12:03	0.51	0.60	1.00
MH212-MH214	CONDUIT	309.84	0 12:04	0.58	0.66	1.00
MH214-MH1013	CONDUIT	310.75	0 12:03	0.58	0.65	1.00
MH218-MH200	CONDUIT	59.57	0 12:01	0.81	0.64	0.64
MH220-MH210	CONDUIT	38.03	0 12:07	0.34	0.43	1.00
MH222-MH224	CONDUIT	33.34	0 12:05	0.30	0.35	1.00
MH224-MH212	CONDUIT	53.34	0 12:08	0.34	0.42	1.00
MH230-MH222	CONDUIT	22.46	0 12:04	0.46	0.55	0.96
MS-CB01	CONDUIT	19.31	0 12:00	0.41	0.00	0.02
MS-CBMH01(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.08
MS-CBMH01(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.10
MS-CBMH02(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.13
MS-CBMH02(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.01
MS-CBMH03(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.13
MS-CBMH03(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.11
MS-CBMH04(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.14
MS-CBMH04(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.10
MS-CBMH05(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.07
MS-CBMH05(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.07
MS-CBMH06(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
MS-CBMH06(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.07
MS-CBMH07(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.10
MS-CBMH07(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.11
MS-CBMH08(1)	CONDUIT	3.02	0 12:04	0.01	0.00	0.15
MS-CBMH08(2)	CONDUIT	3.01	0 12:04	0.01	0.00	0.09
MS-CBMH09(1)	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
MS-CBMH09(2)	CONDUIT	0.00	0 00:00	0.00	0.00	0.13

MS-CBMH10(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-CBMH10(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-CBMH11(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.10
MS-CBMH11(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-CBMH12(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
MS-CBMH12(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.10
MS-CBMH13(1)	CONDUIT	32.67	0	11:56	0.14	0.00	0.15
MS-CBMH13(2)	CONDUIT	32.64	0	11:56	0.17	0.00	0.15
MS-CBMH14(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-CBMH14(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.10
MS-CBMH15(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.07
MS-CBMH15(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-CBMH16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-HP01(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-HP01(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-HP02(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-HP02(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-HP03	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-RYE01	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-RYE02	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-RYE03(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-RYE03(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-RYE04(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-RYE04(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.10
MS-RYE05(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-RYE05(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.07
MS-RYE06(1)	CONDUIT	3.52	0	12:01	0.04	0.00	0.13
MS-RYE06(2)	CONDUIT	0.47	0	12:01	0.01	0.00	0.14
MS-RYE07(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-RYE07(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS-RYE08(1)	CONDUIT	10.72	0	12:00	0.08	0.00	0.16
MS-RYE08(2)	CONDUIT	9.49	0	12:00	0.10	0.00	0.14
MS-RYE09(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-RYE09(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-RYE10(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS-RYE10(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-RYE11(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-RYE11(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-RYE12(1)	CONDUIT	18.24	0	12:00	0.16	0.00	0.19
MS-RYE12(2)	CONDUIT	18.90	0	12:00	0.16	0.00	0.19
MS-RYT01(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
MS-RYT01(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MS-RYT01(3)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-RYT02(1)	CONDUIT	9.65	0	12:22	0.08	0.00	0.15
MS-RYT02(2)	CONDUIT	9.65	0	12:22	0.61	0.00	0.07
MS-RYT03(1)	CONDUIT	1.60	0	12:00	0.01	0.00	0.21
MS-RYT03(2)	CONDUIT	2.24	0	12:00	0.01	0.00	0.21
MS-RYT04(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
MS-RYT04(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.19
MS-RYT05(1)	CONDUIT	8.36	0	12:00	0.05	0.00	0.21
MS-RYT05(2)	CONDUIT	5.96	0	12:02	0.11	0.00	0.15
MS-RYT06(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-RYT06(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-RYT07(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-RYT07(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MS-RYT09(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS-RYT09(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
RYE01-RYT01-Dummy	CONDUIT	6.23	0	11:58	0.13	0.14	1.00
RYE02-CBMH16	CONDUIT	11.80	0	12:00	0.43	0.28	1.00
RYE03-RYT09	CONDUIT	3.49	0	11:50	0.09	0.08	1.00
RYE04-RYT03(1)	CONDUIT	20.64	0	12:00	0.42	0.51	1.00
RYE04-RYT03(2)	CONDUIT	20.54	0	12:00	0.14	0.09	1.00
RYE05-RYT04	CONDUIT	8.25	0	11:50	0.17	0.19	1.00
RYE06-RYT06	CONDUIT	40.13	0	12:00	0.82	0.95	1.00
RYE07-CBMH01	CONDUIT	18.73	0	12:54	0.38	0.44	1.00
RYE08-RYT07	CONDUIT	39.85	0	11:58	0.81	0.95	1.00
RYE09-RYT02	CONDUIT	11.58	0	11:50	0.24	0.27	1.00
RYE09-RYT07	CONDUIT	8.58	0	11:50	0.17	0.21	1.00
RYE10-RYT08	CONDUIT	12.95	0	11:51	0.41	0.31	1.00
RYE11-CBMH09	CONDUIT	25.42	0	11:59	0.31	0.09	1.00
RYE12-RYT03	CONDUIT	18.13	0	11:57	0.37	0.42	1.00
RYT01-CBMH06	CONDUIT	33.67	0	11:54	0.12	0.16	1.00
RYT01-Dummy-RYT01	CONDUIT	6.34	0	11:58	0.05	0.03	1.00
RYT02-RYT03	CONDUIT	23.13	0	11:49	0.47	0.55	1.00
RYT03-CBMH14	CONDUIT	15.26	0	11:49	0.26	0.07	1.00
RYT04-RYT05	CONDUIT	23.66	0	11:50	0.48	0.56	1.00
RYT05-CBMH04	CONDUIT	30.10	0	11:58	0.61	0.71	1.00
RYT06-CBMH03	CONDUIT	33.74	0	12:01	0.12	0.14	1.00
RYT07-CBMH02	CONDUIT	39.92	0	12:01	0.09	0.09	1.00
RYT08-CBMH08	CONDUIT	11.86	0	11:52	0.24	0.20	1.00
O-CBMH01	ORIFICE	20.05	0	12:10			1.00
O-CBMH02	ORIFICE	31.88	0	12:08			1.00
O-CBMH03	ORIFICE	19.18	0	12:12			1.00
O-CBMH04	ORIFICE	14.03	0	12:46			1.00
O-CBMH05	ORIFICE	19.97	0	12:05			1.00
O-CBMH06	ORIFICE	35.83	0	12:08			1.00
O-CBMH07	ORIFICE	38.89	0	12:04			1.00
O-CBMH08	ORIFICE	10.88	0	12:29			1.00
O-CBMH09	ORIFICE	19.96	0	12:09			1.00
O-CBMH10	ORIFICE	22.46	0	12:03			1.00
O-CBMH11	ORIFICE	17.96	0	12:03			1.00
O-CBMH12	ORIFICE	6.77	0	12:10			1.00
O-CBMH13	ORIFICE	7.31	0	12:41			1.00
O-CBMH14	ORIFICE	6.56	0	12:22			1.00
O-CBMH15	ORIFICE	15.19	0	12:03			1.00
O-CBMH16	ORIFICE	24.18	0	12:00			1.00
O-CB01	DUMMY	4.41	0	12:00			

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Flow Classification Summary
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	Adjusted	Fraction of Time in Flow Class								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
CBMH16-MH218	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.02	0.00
Dummy-CBMH09	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH200-MH202	1.00	0.00	0.00	0.00	0.92	0.00	0.00	0.07	0.86	0.00
MH202-MH204	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH204-MH206	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH206-MH208	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH208-MH210	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH210-MH212	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH212-MH214	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH214-MH1013	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH218-MH200	1.00	0.00	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
MH220-MH210	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH222-MH224	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH224-MH212	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH230-MH222	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MS-CB01	1.00	0.00	0.00	0.00	0.98	0.02	0.00	0.00	0.00	0.00
MS-CBMH01(1)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH01(2)	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH02(1)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH02(2)	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH03(1)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH03(2)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH04(1)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH04(2)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH05(1)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH05(2)	1.00	0.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH06(1)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH06(2)	1.00	0.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH07(1)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH07(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH08(1)	1.00	0.86	0.13	0.00	0.01	0.00	0.00	0.00	0.49	0.00
MS-CBMH08(2)	1.00	0.89	0.10	0.00	0.01	0.00	0.00	0.00	0.50	0.00
MS-CBMH09(1)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH09(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH10(1)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH10(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH11(1)	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH11(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH12(1)	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH12(2)	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH13(1)	1.00	0.89	0.02	0.00	0.09	0.00	0.00	0.00	0.47	0.00
MS-CBMH13(2)	1.00	0.87	0.04	0.00	0.09	0.00	0.00	0.00	0.47	0.00
MS-CBMH14(1)	1.00	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH14(2)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH15(1)	1.00	0.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH15(2)	1.00	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CBMH16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP01(1)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP01(2)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP02(1)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP02(2)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-HP03	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE01	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE02	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE03(1)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE03(2)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MS-RYE04(1)	1.00	0.73	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE04(2)	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE05(1)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE05(2)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE06(1)	1.00	0.87	0.01	0.00	0.07	0.00	0.00	0.06	0.03	0.00
MS-RYE06(2)	1.00	0.87	0.01	0.00	0.11	0.00	0.00	0.02	0.05	0.00
MS-RYE07(1)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE07(2)	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE08(1)	1.00	0.86	0.01	0.00	0.08	0.00	0.00	0.05	0.03	0.00
MS-RYE08(2)	1.00	0.86	0.01	0.00	0.10	0.00	0.00	0.03	0.05	0.00
MS-RYE09(1)	1.00	0.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE09(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE10(1)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE10(2)	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE11(1)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE11(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYE12(1)	1.00	0.72	0.11	0.00	0.18	0.00	0.00	0.00	0.40	0.00
MS-RYE12(2)	1.00	0.72	0.11	0.00	0.18	0.00	0.00	0.00	0.39	0.00
MS-RYT01(1)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT01(2)	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT01(3)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT02(1)	1.00	0.72	0.16	0.00	0.13	0.00	0.00	0.00	0.43	0.00
MS-RYT02(2)	1.00	0.85	0.02	0.00	0.05	0.00	0.00	0.08	0.02	0.00
MS-RYT03(1)	1.00	0.72	0.06	0.00	0.23	0.00	0.00	0.00	0.34	0.00
MS-RYT03(2)	1.00	0.72	0.06	0.00	0.23	0.00	0.00	0.00	0.34	0.00
MS-RYT04(1)	1.00	0.85	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT04(2)	1.00	0.84	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT05(1)	1.00	0.83	0.01	0.00	0.15	0.00	0.00	0.01	0.06	0.00
MS-RYT05(2)	1.00	0.83	0.01	0.00	0.07	0.00	0.00	0.09	0.03	0.00
MS-RYT06(1)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT06(2)	1.00	0.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT07(1)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT07(2)	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT09(1)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RYT09(2)	1.00	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE01-RYT01-Dummy	1.00	0.65	0.16	0.00	0.19	0.00	0.00	0.00	0.45	0.00
RYE02-CBMH16	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.95	0.00	0.00
RYE03-RYT09	1.00	0.43	0.01	0.00	0.56	0.00	0.00	0.00	0.19	0.00
RYE04-RYT03(1)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.50	0.00
RYE04-RYT03(2)	1.00	0.00	0.00	0.00	0.65	0.00	0.00	0.35	0.04	0.00
RYE05-RYT04	1.00	0.44	0.32	0.00	0.24	0.00	0.00	0.00	0.39	0.00
RYE06-RYT06	1.00	0.00	0.00	0.00	0.17	0.00	0.00	0.83	0.01	0.00
RYE07-CBMH01	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYE08-RYT07	1.00	0.00	0.00	0.00	0.21	0.00	0.00	0.79	0.05	0.00
RYE09-RYT02	1.00	0.41	0.13	0.00	0.46	0.00	0.00	0.00	0.18	0.00
RYE09-RYT07	1.00	0.63	0.16	0.00	0.21	0.00	0.00	0.00	0.44	0.00
RYE10-RYT08	1.00	0.00	0.00	0.00	0.17	0.00	0.00	0.83	0.01	0.00
RYE11-CBMH09	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYE12-RYT03	1.00	0.40	0.01	0.00	0.46	0.00	0.00	0.13	0.01	0.00
RYT01-CBMH06	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.31	0.00
RYT01-Dummy-RYT01	1.00	0.00	0.54	0.00	0.46	0.00	0.00	0.00	0.33	0.00
RYT02-RYT03	1.00	0.30	0.11	0.00	0.50	0.00	0.00	0.09	0.14	0.00
RYT03-CBMH14	1.00	0.00	0.00	0.00	0.94	0.00	0.00	0.06	0.01	0.00
RYT04-RYT05	1.00	0.41	0.02	0.00	0.22	0.00	0.00	0.34	0.01	0.00
RYT05-CBMH04	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.82	0.00
RYT06-CBMH03	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYT07-CBMH02	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RYT08-CBMH08	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.87	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
Dummy-CBMH09	1.61	1.61	1.62	0.01	0.01
MH204-MH206	0.01	0.01	0.61	0.01	0.01
MH206-MH208	0.56	0.56	1.63	0.01	0.01
MH208-MH210	1.44	1.44	24.00	0.01	0.01
MH210-MH212	24.00	24.00	24.00	0.01	0.01
MH212-MH214	24.00	24.00	24.00	0.01	0.01
MH214-MH1013	24.00	24.00	24.00	0.01	0.69
MH220-MH210	1.00	1.00	24.00	0.01	0.01
MH222-MH224	0.60	0.60	2.07	0.01	0.01
MH224-MH212	1.62	1.62	24.00	0.01	0.01
MH230-MH222	0.01	0.01	0.65	0.01	0.01
RYE01-RYT01-Dummy	1.09	1.09	1.22	0.01	0.01
RYE02-CBMH16	0.26	0.26	0.28	0.01	0.01
RYE03-RYT09	7.15	7.15	7.32	0.01	0.01
RYE04-RYT03(1)	9.03	9.03	9.65	0.01	0.01
RYE04-RYT03(2)	7.46	7.46	7.54	0.01	0.01
RYE05-RYT04	2.73	2.73	2.92	0.01	0.01
RYE06-RYT06	1.79	1.79	1.93	0.01	0.09
RYE07-CBMH01	1.50	1.50	1.70	0.01	0.01
RYE08-RYT07	1.71	1.71	1.91	0.01	0.11
RYE09-RYT02	7.32	7.32	7.96	0.01	0.01
RYE09-RYT07	1.70	1.70	1.91	0.01	0.01
RYE10-RYT08	2.11	2.11	2.21	0.01	0.01
RYE11-CBMH09	1.60	1.60	1.62	0.01	0.01
RYE12-RYT03	7.87	7.87	8.16	0.01	0.01
RYT01-CBMH06	0.88	0.88	0.89	0.01	0.01
RYT01-Dummy-RYT01	0.87	0.87	0.88	0.01	0.01
RYT02-RYT03	7.96	7.96	9.54	0.01	0.01
RYT03-CBMH14	7.78	7.78	7.81	0.01	0.18
RYT04-RYT05	2.92	2.92	3.29	0.01	0.01
RYT05-CBMH04	3.37	3.37	3.73	0.01	0.01
RYT06-CBMH03	1.96	1.96	1.99	0.01	0.01
RYT07-CBMH02	1.76	1.76	1.79	0.01	0.01
RYT08-CBMH08	2.55	2.55	2.74	0.01	0.01

Analysis begun on: Wed Sep 29 10:18:54 2021
Analysis ended on: Wed Sep 29 10:18:56 2021
Total elapsed time: 00:00:02

HGL Summary Phase 1 (JFSA - 2019)

Notes:

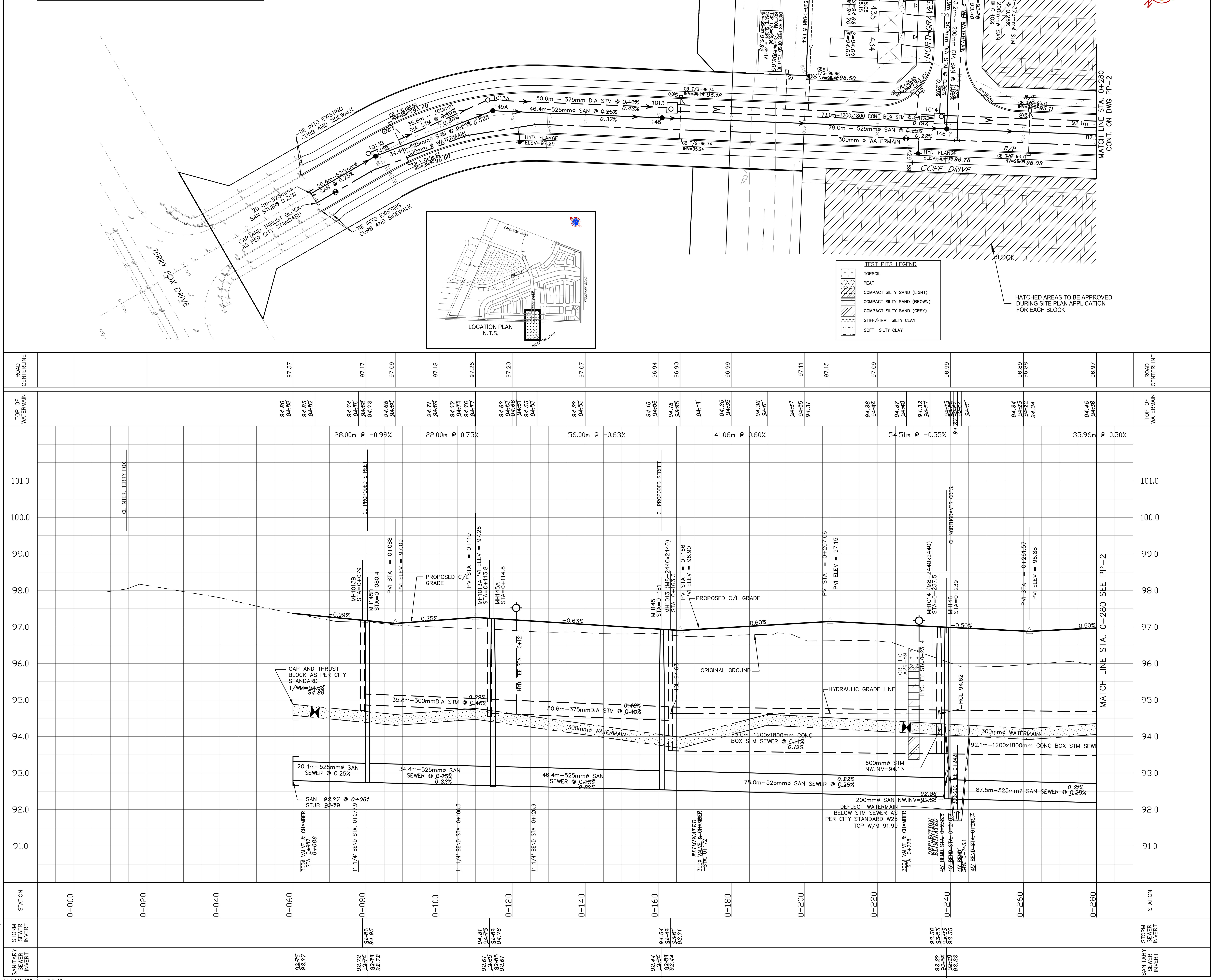
1) both 24hr SCS and 3hr CHI storm HGL uses 24hr SCS dynamic BC from JFSA Monahan Drain Future-VIL VURL model (March 2019) a fixed BC = 94.708 (100 yr SCS peak at PH1 outlet) was also used for the 3hr CHI event

Name	Ground (m)	USF (m)	HGL (m)			Difference USF-HGL (m)			Invert (m)
			24hr SCS	3hr CHI	Fixed 3hr CHI BC = 94.708	24hr SCS	3hr CHI	Fixed 3hr CHI BC=94.708	
1001	98.17	96.15	95.32	95.32	95.32	0.83	0.83	0.83	95.32
1002	97.85	96.08	95.28	95.28	95.28	0.80	0.80	0.80	95.07
1004E	97.91	95.84	95.17	95.17	95.17	0.67	0.67	0.67	95.43
1004N	97.91	95.84	95.53	95.53	95.53	0.31	0.31	0.31	-
1005	97.91	95.70	94.97	94.97	95.09	0.73	0.73	0.61	94.91
1006	97.70	95.50	94.83	94.74	95.05	0.67	0.76	0.45	94.35
1007	98.02	N/A	95.16	95.16	95.16	-	-	-	95.16
1008	97.95	N/A	95.10	95.10	95.13	-	-	-	94.89
1009	97.74	95.88	94.99	95.00	95.09	0.89	0.88	0.79	94.69
1010	97.67	95.77	94.82	94.78	95.05	0.95	0.99	0.72	94.44
1011	97.35	95.23	94.76	94.71	95.00	0.47	0.52	0.23	94.11
1012	97.02	N/A	94.76	94.71	95.00	-	-	-	93.91
1013	96.92	N/A	94.78	94.71	95.05	-	-	-	93.61
1014	97.00	N/A	94.77	94.71	95.03	-	-	-	93.53
1015	97.49	N/A	94.75	94.71	94.99	-	-	-	93.43
1016	96.79	N/A	94.74	94.71	94.95	-	-	-	93.33
1017	97.86	96.00	95.14	95.14	95.14	0.86	0.86	0.86	95.14
1018	97.78	95.60	95.05	95.05	95.07	0.55	0.55	0.53	94.85
1019	97.44	95.67	94.85	94.77	95.04	0.82	0.90	0.63	94.59
1020	97.40	95.32	94.85	94.72	95.04	0.47	0.60	0.28	94.49
1021	97.25	95.32	94.84	94.71	95.03	0.48	0.61	0.29	94.38
1022	97.53	95.70	95.12	95.12	95.15	0.58	0.58	0.55	94.88
1023	97.34	95.29	94.93	94.92	95.10	0.36	0.37	0.19	94.57
1024	97.19	95.27	94.83	94.71	95.03	0.44	0.56	0.24	94.18
1025	97.17	95.27	94.82	94.71	95.01	0.45	0.56	0.26	94.04
1026	97.55	95.47	94.89	94.89	95.07	0.58	0.58	0.40	94.76
1027	97.31	95.39	94.86	94.76	95.06	0.53	0.63	0.33	94.44
1028	97.09	95.31	94.81	94.71	95.00	0.50	0.60	0.31	94.18
1029	96.95	95.09	94.80	94.71	94.98	0.29	0.38	0.11	93.91
1030	98.00	95.23	94.75	94.71	94.91	0.48	0.52	0.32	94.39
1031	98.00	95.10	94.74	94.71	94.90	0.36	0.39	0.20	94.01
1033N	97.50	95.85	95.23	95.23	95.23	0.62	0.62	0.62	95.23
1033S	97.50	95.85	95.32	95.32	95.32	0.53	0.53	0.53	-
1034	97.43	95.75	95.32	95.32	95.32	0.43	0.43	0.43	95.11
1035	97.20	95.65	95.18	95.18	95.24	0.47	0.47	0.41	94.99
1035N	97.20	95.65	95.03	95.03	95.09	0.62	0.62	0.56	-
1036	97.34	95.51	94.91	94.89	95.07	0.60	0.62	0.44	94.60
1037	97.50	95.73	95.13	95.13	95.13	0.60	0.60	0.60	95.13
1038	97.33	95.58	95.12	95.12	95.12	0.46	0.46	0.46	94.94
1039	97.26	95.27	94.84	94.78	95.05	0.43	0.49	0.22	94.46
1040	97.15	95.40	94.89	94.89	95.02	0.51	0.51	0.38	94.76
1041	97.14	95.28	94.81	94.71	95.02	0.47	0.57	0.26	94.48
1042	97.19	95.14	94.79	94.71	95.00	0.35	0.43	0.14	94.09
1043	97.07	95.42	94.90	94.82	95.12	0.52	0.60	0.30	94.45
1044	97.02	95.32	94.79	94.79	94.99	0.53	0.53	0.33	94.65
1045	97.00	95.09	94.77	94.71	94.98	0.32	0.38	0.11	94.25
1046	96.70	95.00	94.76	94.71	94.96	0.24	0.29	0.04	93.86
1047	96.63	94.90	94.74	94.71	94.94	0.16	0.19	-0.04	93.74
1048	96.50	N/A	94.74	94.71	94.91	-	-	-	-
1048A	96.07	N/A	94.75	94.71	94.93	-	-	-	-
1049	96.86	95.05	94.74	94.71	94.92	0.31	0.34	0.13	93.72
1050	96.83	95.02	94.73	94.71	94.91	0.29	0.31	0.11	93.70
1051	96.75	95.02	94.75	94.71	94.89	0.27	0.31	0.13	93.58
1052	97.04	N/A	94.76	94.71	94.83	-	-	-	93.13
1053	97.22	95.42	95.06	95.06	95.22	0.36	0.36	0.20	94.72
1053B	97.20	N/A	94.81	95.15	94.80	-	-		93.09
DIVERSION	95.65	N/A	94.80	94.69	94.83	-	-	-	93.09
Monahan	95.05	N/A	94.71	94.71	94.71	-	-	-	92.88
N138	95.65	N/A	94.74	94.71	94.74	-	-	-	93.08

Level of clearance to USF less than 0.3 m

Level of clearance to USF less than 0.0 m

"STANTEC CONSULTING LTD. UNDERTOOK A GENERAL REVIEW OF CONSTRUCTION ACTIVITIES DURING THE INSTALLATION OF SANITARY AND STORM SEWERS AND WATERMAIN FOR THIS PROJECT. IN OUR OPINION AND TO THE BEST OF OUR KNOWLEDGE, THE WORK HAS BEEN COMPLETED IN GENERAL CONFORMANCE WITH THE CITY OF OTTAWA STANDARDS AND THE APPROVED DESIGN AND DRAWINGS."



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Notes

1 ALL MATERIALS AND CONSTRUCTION METHODS TO BE IN ACCORDANCE WITH OPS AND CITY OF OTTAWA STANDARD SPECIFICATIONS AND DRAWINGS AND OPSD SUPPLEMENT. ONTARIO PROVINCIAL STANDARDS WILL APPLY WHERE NO CITY STANDARDS ARE AVAILABLE.

2 SERVICE AND UTILITY LOCATIONS ARE APPROXIMATE, CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING SERVICES AND UTILITIES PRIOR TO ANY CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING LOCATES FROM ALL UTILITY COMPANIES TO LOCATE EXISTING UTILITIES PRIOR TO EXCAVATION. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION AND REINSTATEMENT.

3 ALL DISTURBED AREAS SHALL BE REINSTATED TO EQUAL OR BETTER CONDITION TO THE SATISFACTION OF THE ENGINEER & THE CITY. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH OPSD 509.010 AND OPSS 310.

4 STORM AND SANITARY SEWERS 375mm DIA. OR SMALLER SHALL BE PVC SDR 35. STORM AND SANITARY SEWERS LARGER THAN 375mm DIA. SHALL BE CONCRETE CSA A 257 CLASS 100 D. INSTALLED AS PER CITY OF OTTAWA S6 AND S7

5 THE CONTRACTOR SHALL CONSTRUCT WATERMAIN,WATER SERVICES,CONNECTIONS & APPURTENANCES AS PER CITY OF OTTAWA SPECIFICATIONS & SHALL CO-ORDINATE AND PAY ALL RELATED COSTS INCLUDING THE COST OF CONNECTION,INSPECTION & DISINFECTION BY CITY PERSONNEL.SERVICE CONNECTIONS SHALL BE INSTALLED A MINIMUM OF 2400mm FROM ANY CATCHBASIN, MANHOLE, OR OBJECT THAT MAY CONTRIBUTE TO FREEZING. THERMAL INSULATION SHALL BE INSTALLED ON ALL PROPOSED CB'S ON THE W/M STREET SIDE WHERE 2400mm SEPARATION CANNOT BE ACHIEVED.(AS PER CITY OF OTTAWA W22 & W23)(CATHODIC PROTECTION AS PER CITY OF OTTAWA W40 AND W42). WATERMAIN PIPE MATERIAL SHALL BE PVC CL.150 DR18. DEFLECTION OF WATERMAIN PIPE IS NOT TO EXCEED 1/2 OF THAT SPECIFIED BY THE MANUFACTURER.

6 STREET LIGHTING TO CITY OF OTTAWA STANDARDS.

7 STORM AND SANITARY MANHOLES SHALL BE 1200mm DIAMETER IN ACCORDANCE WITH OPSD-701.01 (UNLESS OTHERWISE NOTED) c/w FRAME AND COVER AS PER CITY OF OTTAWA S24 AND S25. ALL MANHOLE SIZES TO BE CONFIRMED BY SUPPLIER PRIOR TO INSTALLATION.

8 CATCH BASINS SHALL BE IN ACCORDANCE WITH CITY STANDARDS c/w FRAME AND GRATE AS PER S20 AND S21 FOR REAR YARDS AND S3 FOR STREET CB'S. PROVIDE 150mm ADJUSTED SPACERS. ALL CATCH BASINS SHALL HAVE SUMPS (600mm DEEP). CATCH BASIN LEADS SHALL BE 200mm DIA.(MIN) PVC SDR 35 AT 1.0% GR. STREET CB'S WILL BE INSTALLED WITH 'IPEX' INLET CONTROL DEVICE (ICD)

9 EXCESS EXCAVATED MATERIAL SHALL BE PLACED AT A LOCATION ON SITE AS DIRECTED BY THE OWNER.

10 THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE PROTECTION FOR RECEIVING STORM SEWERS OR DRAINAGE DURING CONSTRUCTION ACTIVITIES. (ie: FILTER CLOTH ON CATCH BASINS, STRAW BALE CHECK DAMS AND SEDIMENT CONTROLS AROUND ALL DISTURBED AREAS). DEWATERING SHALL BE PUMPED INTO SEDIMENT TRAPS. (SEE EROSION CONTROL PLAN).

11 GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300 mm AROUND ALL STRUCTURES WITHIN PAVEMENT AREA

12 SEWER TRENCH SHALL CONSIST OF A CLASS "B" BEDDING AS PER CITY OF OTTAWA STANDARDS S6 AND S7. COMPACTION SHALL BE A MINIMUM OF 98% STANDARD PROCTOR DENSITY.

13 ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.

14 ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH ARCHITECT AND THE CITY OF OTTAWA PRIOR TO TREE CUTTING.

15 CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 410 AND OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL STORM AND SANITARY SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE CONSULTANT FOR REVIEW.

16 ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS & NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE CONSULTANT.

17 SUB-EXCAVATE SOFT AREAS & FILL WITH GRANULAR 'B' COMPACTED IN 0.15m LAYERS.

18 FOR ALL LANDSCAPING FEATURES (ie. TREES, WALKWAYS, PARK DETAILS, NOISE BARRIERS, FENCES etc.) REFER TO LANDSCAPE ARCHITECT PLAN

19 CONCRETE CURBS SHALL BE CONSTRUCTED AS PER CITY STANDARD SC1.1 & SC1.3

20 ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.

21 PRESSURE REDUCING VALVES ARE REQUIRED ON ALL UNITS AS PER THE ONTARIO BUILDING CODE.

22 THE CLAY SEALS TO BE INSTALLED AS PER CITY STANDARD DRAWING NO. S8. THE SEALS SHOULD BE AT LEAST 1.5m LONG (IN THE TRENCH DIRECTION) AND SHOULD EXTEND FROM TRENCH WALL TO TRENCH WALL. THE SEALS SHOULD EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUBBEDDING AND COVER MATERIAL. THE BARRIERS SHOULD CONSIST OF RELATIVELY DRY AND COMPACTABLE BROWN SILTY CLAY PLACED IN MAXIMUM 225mm THICK LOOSE LAYERS COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD. THE CLAY SEALS SHOULD BE PLACED AT THE SITE BOUNDARIES AND AT STRATEGIC LOCATIONS AT NO MORE THAN 50m INTERVALS IN THE SERVICE TRENCHES.

23 REFER TO GEOTECHNICAL REPORT PREPARED BY HOULE CHEVRIER ENGINEERING DATED SEPT 21, 2006 FOR ALL TEST PIT AND BORE HOLE INFORMATION.

24 GEOTECHNICAL ENGINEER TO CONFIRM AND DIRECT ON SITE PLACEMENT AND COMPACTION OF BLAST ROCK WITHIN THE R.O.W. AND THE UNDER SIDE OF FOUNDATIONS.

Revision		By	Appd.	YY.MM.DD
8	*AS RECORDED – STAGE 'A'*	*DT*	*JJ*	*09.06.16*
7	REVISED DRIVEWAY & SIDEWALK LOCATIONS, ISSUED FOR FINAL APPROVAL	KJK	JBL	09.02.25
6	REVISED FINISHED ROAD GRADES ON COPE, TEMPLEFORD AND NORTHGRAVES (s)	KJK	JBL	08.11.12
5	REVISED LOT GRADING AND SERVICING	KJK	JBL	08.11.03
4	ISSUED FOR CONSTRUCTION	KJK	JBL	08.01.21
3	REVISED AS PER CITY COMMENTS AND FINAL APPROVAL	KJK	JBL	07.10.29
2	REVISED AS PER CITY COMMENTS	KJK	JBL	07.08.17
1.	ISSUED FOR CITY COMMENTS	KJK	JBL	07.07.12

File Name: 160400502C–Cope Drive	NI	JBL	KJK	07.03.26
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Seal

RECORD DRAWING
DATE *JUN.16/09*

Client/Project
CAVANAGH CONSTRUCTION LTD.

SOHO - KANATA SOUTH

Ottawa ON Canada

Title
COPE DRIVE
STA. 0+000 TO STA. 0+280

Project No. 160400502C
Scale 1:500H 1:50V

Drawing No. PP-1
Sheet 7 of 58
Revision 8

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30m above the 100-year water level (City of Ottawa).
- Major system flow to be restricted to 781 L/s during the 100 year storm event (Soho West (Phase 1 and 2), Stormwater Management Report)
- Rooftop and parking lot storage to be maximized where possible.
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.30m (City of Ottawa).
- Provide adequate emergency overflow conveyance off-site (City of Ottawa).
- Enhanced quality control (80% TSS removal) has been provided downstream of the development in Vortechs Cell 1 hydrodynamic separator.

5.2.1 Allowable Release Rate

The overall approach for storm servicing and stormwater management for the proposed development was initially outlined in the Serviceability Report – Cavanaugh Construction Ltd. / Karam SOHO West – Rev 3, Stantec Consulting Ltd., October 31, 2007 and Cavanaugh Construction – Soho West (Phase 1 and 2), Stormwater Management Report, Stantec Consulting Ltd. October 31, 2007

Discharge rates were assigned to the undeveloped parcels upstream of the SOHO Phase 1 subdivision. These are summarized in **Table 1** below. The external contributions are also identified on the Overall Storm Drainage Plan, OSD, SOHO-Kanata South included in **Appendix C.4**. The subject lands were identified as FUT-13B in the SOHO Phase 1 design.

Table 1: Target Release Rates for External Development Lands – SOHO-Kanata South

Drainage Area	Description	Minor System 100 Year Storm (L/s)	Major System 100 Year Storm (L/s)	Total Flow 100 Year Storm (L/s)
FUT-13A	Claridge Residential Lands	702.10	1,537	2,239
FUT-13B	Commercial Shopping Development (subject lands)	317.10	781	1,098

Segment	Maximum Volume Used (m^3)	Max. Ponding Depth (cm)	Depth at Curb/Swale (cm)	Max. ICD Inflow (L/s)	Overflow Peak[1] (L/s)
1-6CR	4.1	10.00	10.25	44.00	282
1-6DS	-	-	26.17	22.00	32
1-7AR	-	-	4.44	0.00	42
1-8AR	21.2	19.00	10.86	44.00	334
1-8BS	-	-	27.45	22.00	47
1-9AR	0.7	6.00	3.79	22.00	6
1-9BS	-	-	25.55	22.00	26
1-10AR	4.3	10.00	7.02	22.00	102
1-10BS	-	-	28.50	22.00	51
1-10CS	-	-	15.92	9.74	0
1-11AR	4.3	12.00	10.12	22.00	293
1-11BS	-	-	16.02	9.92	0
1-12AP	19.9	20.00	0.89	22.00	27
1-12BP	14.2	15.00	0.67	19.82	0
FUT-13AR	495.6	N/A	23.26	702.10	1,537
FUT-13BR	223.8	N/A	16.56	317.10	781
COPE-13AR	21.2	19.00	20.01	22.00	1,817
COPE-13BR	14.9	16.00	6.02	22.00	53
1-13AR	-	13.00	5.24	22.00	37
1-13BS	-	-	24.63	22.00	36
1-14R	62.0	22.00	20.07	22.00	1,833
1-15AR	43.8	22.00	20.22	22.00	1,869
1-15BR	21.3	17.00	10.64	22.00	337
1-16AS	-	-	31.33*	22.00	93
1-16BR	9.3	24.00	12.78	22.00	552
1-17AR	19.9	16.00	6.53	22.00	79
1-18AR	4.3	9.00	7.79	22.00	140
1-18BS	-	-	28.79	22.00	66
1-20AR	4.3	9.00	9.74	22.00	262
1-22AR	4.3	11.00	11.28	22.00	392
1-22BR	4.3	10.00	11.90	22.00	444
1-22CS	-	-	27.28	22.00	43
1-23AR	49.2	27.00	14.91	44.00	800
1-23BR	21.3	20.00	12.37	22.00	500
1-23CS	-	-	29.47	22.00	58
1-23DS	-	-	13.7		
1-23ES	-	-	24.3		
1-25AR	6.3	12.00	15.0		
1-26AR	6.3	12.00	6.41		
1-27AR	1.8	7.00	7.05		
1-27BR	1.8	7.00	7.81		
1-27CS	-	-	28.7		
1-27DS	-	-	28.1		
1-27ES	-	-	27.2		
1-28AR	21.2	20.00	16.1		
1-30AR	32.0	21.00	6.6(		
1-31AR	32.0	18.00	17.5		

MINOR SYSTEM:
SITE AREA = 3.73ha
ALLOWABLE = 317.10 L/s (85L/s/ha)

MAJOR SYSTEM STORAGE:
SITE AREA = 3.73ha
MAXIMUM VOLUME USED = 223.8m^3
(60m^3/ha)

Drew Blair

From: Mike Petepiece
Sent: Friday, May 7, 2021 2:00 PM
To: Marc St.Pierre; Drew Blair
Subject: FW: SOHO Phase 1 - Monahan Drain

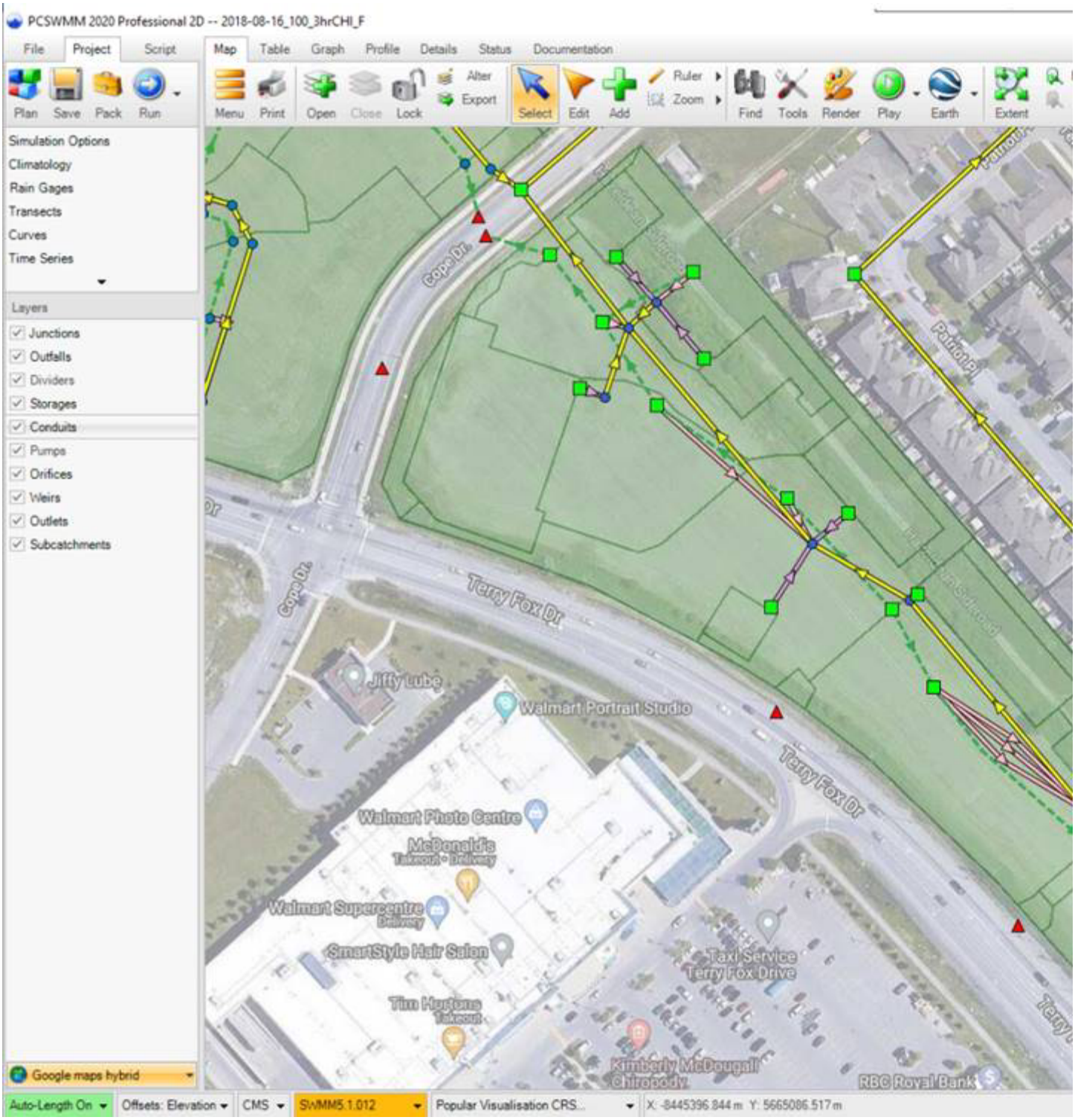
Hi Drew/MSP,
I met with Jonathon Burnett at JFSA this morning and he confirmed that the latest modeling for our area has a minor system inlet rate of 85 L/s/ha (316 L/s divided by 3.73 ha).
See email below.

Michael Petepiece, P.Eng., Senior Project Manager | Water Resources
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 235 | Cell: 613.299.4677 | Fax: 613.254.5867

From: Jonathon Burnett <jburnett@jfsa.com>
Sent: Friday, May 7, 2021 1:04 PM
To: Mike Petepiece <m.petepiece@novatech-eng.com>
Subject: SOHO Phase 1 - Monahan Drain

Hi Mike,

Looking over the Stantec model we have on file, I can confirm that the peak 100-Year minor system flow is 316 L/s (from memory I think the report you showed me today said 317 L/s).
Although I was not able to replicate the major system overflow as the model has many overflow locations.
Below is a screenshot from the model; it appears that Stantec did model these lands in reasonably high detail in the past.



Regards,

Jono Burnett, B.Eng., P.Eng
Water Resources Engineer

JFSA

52 Springbrook Drive, Ottawa ON, K2S 1B9
Tel.: 613-322-1253 | Email: jburnett@jfsa.com | Website: www.jfsa.com
Ottawa-Paris(ON)-Gatineau-Montréal-Québec

PROPOSED DEVELOPMENT
FERNBANK ZENS

COPE DRIVE

FERNBANK ROAD

TERRY FOX DRIVE

SITE BENCHMARK
FIRE HYDRANT
Top of Spindle
Elevation=98.10

DRAINAGE AREA BOUNDARY = 3024.5m²

SOFT SURFACE AREA = 2123.2m²

HARD SURFACE AREA = 901.3m²

28m-600mmØ CSP CULVERT @ 0.5%
INV.NW=96.67 OBV.=97.27
INV.SE=96.53 OBV=97.13

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

POST DEVELOPMENT AREA
TRIBUTARY TO CULVERT AT TERRY FOX DRIVE

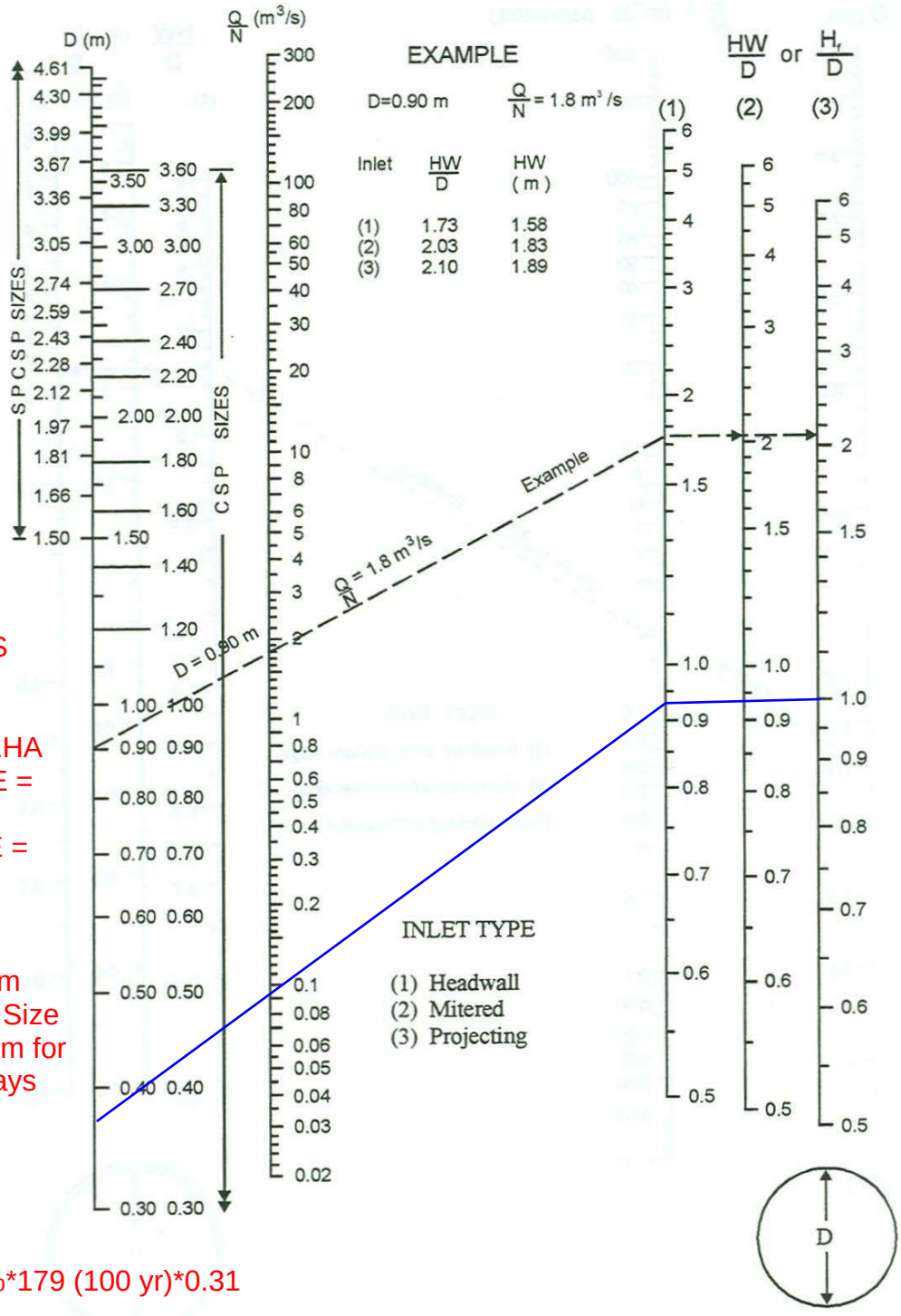
1 : 1500 (0, 15, 30, 45, 60)

NOV 2021 | 121011 | FIG-CULV

SHT11X17.DWG - 279mmX432mm

M:\2021\121011\CAD\Design\Figures\Culvert\121011-Culvert.dwg, CULVERT, Oct 07, 2021 - 9:16am, mmckeough

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts



REFER TO FIGURE CULV FOR DETAILS AND AREA

TOTAL AREA = 0.31HA
AREA HARD SPACE = 0.09HA
AREA SOFT SPACE = 0.22H
AVG C = 0.47

Minimum Culvert Size = 600mm for Driveways

Q= 2.78CIA
Q= 2.78*0.47*125%*179 (100 yr)*0.31
Q=91 L/s

Source: Herr (1977)

Appendix B

SANITARY SEWER DESIGN SHEET
5331 FERNBANK
Developer: Claridge Homes

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT # : 121011
DESIGNED BY : AE/MM
CHECKED BY : DDB
DATE PREPARED : 2-Jun-21
DATE REVISED : 30-Sep-21

LOCATION				RESIDENTIAL									PARK			INFILTRATION			FLOW	PROPOSED SEWER							
				INDIVIDUAL					CUMULATIVE																		
STREET	FROM MH	TO MH	Area	Single Units	Townhouse Units	Apartment Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D_{full}
	119	121	A1			6	0.0126	0.07	0.013	0.07	3.7	0.15		0.00	0.00			0.02	0.18	21.1	200	203.20	DR 35	1.94	47.7	1.47	0.4%	0.00
	123	121	A2			6	0.0126	0.06	0.013	0.06	3.7	0.15		0.00	0.00			0.02	0.17	18.1	200	203.20	DR 35	0.66	27.8	0.86	0.6%	0.00
	121	125	A3				0.0000	0.02	0.025	0.15	3.7	0.30		0.00	0.00			0.05	0.35	39.6	200	203.20	DR 35	0.33	19.7	0.61	1.8%	0.00
																		PL									
	127	125	A4			12	0.0252	0.18	0.025	0.18	3.7	0.30		0.00	0.00			0.06	0.36	20.5	200	203.20	DR 35	0.68	28.2	0.87	1.3%	0.00
	125	101	A5				0.0000	0.008	0.050	0.34	3.7	0.60		0.00	0.00			0.11	0.71	7.1	200	203.20	DR 35	0.42	22.2	0.68	3.2%	0.12
	129	101	A6			6	0.0126	0.07	0.013	0.07	3.7	0.15		0.00	0.00			0.02	0.18	11.0	200	203.20	DR 35	2.00	48.4	1.49	0.4%	0.00
	101	103	A7			0	0.0000	0.17	0.063	0.58	3.6	0.74		0.00	0.00			0.19	0.93	51.0	200	203.20	DR 35	0.33	19.7	0.61	4.7%	0.12
	131	103	A8			12	0.0252	0.18	0.025	0.18	3.7	0.30		0.00	0.00			0.06	0.36	27.6	200	203.20	DR 35	1.01	34.4	1.06	1.0%	0.00
	103	105	A9			0	0.0000	0.13	0.088	0.89	3.6	1.03		0.00	0.00			0.29	1.32	37.7	200	203.20	DR 35	0.35	20.2	0.62	6.5%	0.16
	133	105	A10			12	0.0252	0.13	0.025	0.13	3.7	0.30		0.00	0.00			0.04	0.34	27.5	200	203.20	DR 35	2.00	48.4	1.49	0.7%	0.00
	105	107	A11			0	0.0000	0.17	0.113	1.19	3.6	1.32		0.00	0.00			0.39	1.71	44.2	200	203.20	DR 35	0.34	20.0	0.62	8.6%	0.19
	135	107	A12			12	0.0252	0.18	0.025	0.18	3.7	0.30		0.00	0.00			0.06	0.36	27.5	200	203.20	DR 35	1.53	42.3	1.31	0.9%	0.00
	107	109	A13			6	0.0126	0.09	0.151	1.46	3.6	1.74		0.00	0.00			0.48	2.22	42.7	200	203.20	DR 35	0.33	19.7	0.61	11.3%	0.23
	137	109	A14			12	0.0252	0.13	0.025	0.13	3.7	0.30		0.00	0.00			0.04	0.34	27.5	200	203.20	DR 35	2.00	48.4	1.49	0.7%	0.00
	139	141	A15			6	0.0126	0.06	0.013	0.06	3.7	0.15	0.53	0.53	0.02			0.19	0.37	31.7	200	203.20	DR 35	1.29	38.9	1.20	1.0%	0.00
	141	109	A16			6	0.0126	0.13	0.025	0.19	3.7	0.30		0.53	0.02			0.24	0.56	44.3	200	203.20	DR 35	1.27	38.6	1.19	1.5%	0.00
	109	111	A17			0	0.0000	0.09	0.202	1.87	3.5	2.30		0.00	0.00			0.62	2.91	40.2	200	203.20	DR 35	0.32	19.4	0.60	15.1%	0.27
	145	111	A18			12	0.0252	0.18	0.025	0.18	3.7	0.30		0.00	0.00			0.06	0.36	27.5	200	203.20	DR 35	1.53	42.3	1.31	0.9%	0.00
	143	111	A19			6	0.0126	0.09	0.013	0.09	3.7	0.15		0.00	0.00			0.03	0.18	39.0	200	203.20	DR 35	2.03	48.8	1.50	0.4%	0.00
	111	113	A20			0	0.0000	0.30	0.239	2.44	3.5	2.71		0.00	0.00			0.80	3.52	39.4	200	203.20	DR 35	0.33	19.7	0.61	17.9%	0.29
	147	113	A21			12	0.0252	0.13	0.025	0.13	3.7	0.30		0.00	0.00			0.04	0.34	27.5	200	203.20	DR 35	2.00	48.4	1.49	0.7%	0.00
	113	115	A22			6	0.0126	0.09	0.277	2.66	3.5	3.12		0.00	0.00			0.88	4.00	43.5	200	203.20	DR 35	0.32	19.4	0.60	20.7%	0.30

SANITARY SEWER DESIGN SHEET
5331 FERNBANK
Developer: Claridge Homes

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT # : 121011
DESIGNED BY : AE/MM
CHECKED BY : DDB
DATE PREPARED : 2-Jun-21
DATE REVISED : 30-Sep-21

LOCATION				RESIDENTIAL									PARK			INFILTRATION			FLOW	PROPOSED SEWER							
				INDIVIDUAL					CUMULATIVE																	
STREET	FROM MH	TO MH	Area	Single Units	Townhouse Units	Apartment Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D_{full}
	167	115	A23			12	0.0252	0.18	0.025	0.18	3.7	0.30		0.00	0.00			0.06	0.36	27.5	200	203.20	DR 35	2.00	48.4	1.49	0.7%	0.00
	149	151	A24			6	0.0126	0.09	0.013	0.09	3.7	0.15		0.00	0.00			0.03	0.18	30.5	200	203.20	DR 35	1.31	39.2	1.21	0.5%	0.00
	151	153	A25			6	0.0126	0.13	0.025	0.22	3.7	0.30		0.00	0.00			0.07	0.37	36.5	200	203.20	DR 35	1.32	39.3	1.21	1.0%	0.00
	155	153	A26			6	0.0126	0.09	0.013	0.09	3.7	0.15		0.00	0.00			0.03	0.18	30.5	200	203.20	DR 35	1.02	34.6	1.07	0.5%	0.00
	153	161	A27			0	0.0000	0.02	0.038	0.33	3.7	0.45		0.53	0.02			0.28	0.76	18.3	200	203.20	DR 35	0.33	19.7	0.61	3.8%	0.12
	157	159	A28			6	0.0126	0.07	0.013	0.07	3.7	0.15		0.00	0.00			0.02	0.18	24.2	200	203.20	DR 35	1.74	45.1	1.39	0.4%	0.00
	159	161	A29			0	0.0000	0.14	0.013	0.21	3.7	0.15		0.00	0.00			0.07	0.22	36.8	200	203.20	DR 35	1.71	44.7	1.38	0.5%	0.00
	161	163	A30			0	0.0000	0.02	0.050	0.56	3.7	0.60		0.00	0.00			0.18	0.78	11.7	200	203.20	DR 35	0.34	20.0	0.62	3.9%	0.12
	165	163	A31			6	0.0126	0.05	0.013	0.05	3.7	0.15		0.00	0.00			0.02	0.17	23.7	200	203.20	DR 35	2.03	48.8	1.50	0.3%	0.00
	163	115	A32			6	0.0126	0.08	0.076	0.69	3.6	0.89		0.00	0.00			0.23	1.11	33.2	200	203.20	DR 35	0.33	19.7	0.61	5.7%	0.16
	115	117	A33			0	0.0000	0.05	0.378	3.58	3.4	4.20		0.00	0.00			1.18	5.38	37.2	200	203.20	DR 35	1.10	35.9	1.11	15.0%	0.19
	169	117	A34			6	0.0126	0.06	0.013	0.06	3.7	0.15		0.00	0.00			0.02	0.17	26.2	200	203.20	DR 35	2.02	48.6	1.50	0.4%	0.00
	171	117	A35			6	0.0126	0.05	0.013	0.05	3.7	0.15		0.00	0.00			0.02	0.17	21.5	200	203.20	DR 35	2.00	48.4	1.49	0.3%	0.00
	117	EX MH	A36			0	0.0000	0.00	0.403	3.69	3.4	4.46		0.00	0.00			1.22	5.68	14.8	200	203.20	DR 35	1.89	47.0	1.45	12.1%	0.23

Notes:
1. Q(d) = Qr(p) + Q(i) + Qc(p)
2. Q(i) = 0.33 L/sec/ha
3. Qr(p) = (PxqxM/86,400)
3. Qc(p) = (A*q*Pf)/86,400

Definitions:
Q(d) = Design Flow (L/sec)
Qr(p) = Population Flow (L/sec), Residential
Q(i) = Extraneous Flow (L/sec)
Qc(p) = Population Flow (L/sec), Commercial/Institutional/Park

P = Population (3.4 persons per single unit, 2.7 persons per townhouse unit, 2.1 persons per apartment unit)
q = Average per capita flow = 280 L/cap/day - Residential
q = Average per gross ha. flow = 3700 L/gross ha/day - Park (20L/day/person, 185 persons/ha - as per Appendix 4-A of the City of Ottawa Sewer Design Guidelines)
M = Harmon Formula (maximum of 4.0)
Min pipe size 200mm @ min. slope 0.32%
Mannings n = 0.013
Pf = Peak factor (Commercial/Institional/Park) = 1.0 (less than 20% of total contributing areas), 1.5 (if area is 20% or greater of total contributing area)

day and maximum day demands. At a residual pressure of 20 psi, the available fire flow in the adjacent distribution systems was greater than 10,000 L/min.

4.0 SANITARY SEWER

4.1 Design Flows

The design criteria used to determine the sanitary flows produced by the proposed development is as follows;

Design Residential Domestic Flow per capita	350 L/cap/day
Capita per dwelling	2.7 persons per townhouse
Residential Peak Factor	Where P is population in 1000s; $P.F. = 1 + \frac{14}{\sqrt{4 + P^{0.5}}}$
Commercial Flow	50,000 L/ha/day
Commercial Peak Factor	1.5
Light Industrial Flow	35,000 L/ha/day
Light Industrial (Business Park) Peak Factor	4 (Appendix 4-B Ottawa Sewer Design Guidelines)
Infiltration	0.28 L/ha/day
Minimum Velocity	0.60 m/s
Minimum Pipe Size	250 mm dia. (0.432 % slope)

Table 4.1 - Sanitary Design Flows under Proposed Land Use and Zoning

	Proposed Zoning	Area (ha)	Pop. (1000's)	Peak Popul. Flow Q(p) (L/s)	Peak Busi. Flow Q(i) (L/s)	Peak Comm. Flow Q(c) (L/s)	Peak Extran. Flow Q(e) (L/s)	Peak Design Flow Q(d) (L/s)
Business Park (Light Industrial)	IP	13.58			22.00		3.80	25.81
Residential	R4	8.14	0.608	9.67			2.28	11.95
Commercial	IP	3.73				3.24	1.04	4.28
Total		25.45	0.608	9.67	22.00	3.24	7.13	42.04

16.23 L/s SAN Flow to Cope Dr.

Trevor McKay

From: Cripps, Brad <brad.cripps@ottawa.ca>
Sent: Wednesday, March 20, 2019 11:52 AM
To: Trevor McKay
Cc: Surprenant, Eric
Subject: RE: Comment Clarification - D07-16-190001 & D07-16-18-0027

Hello Trevor,

The comment that was provided related to the Bridlewood 3 application was provided by the water resources group. I have reached out to them to confirm what was meant by that comment and the implications. My understanding now is that there is a spill relief protection for the Fernbank and Stittsville trunk lines near the Hazeldean PS at 95.3m, however there is no such spill point in the South Glencairn trunk line. The operation of the pump station has been set up so that during large events the Fernbank and Stittsville trunk lines will be isolated and allowed to spill if there is a need while the pump station capacity will be reserved for the South Glencairn trunk line.

In speaking with infrastructure planning their recommendation is to use 95.3m as an approximate design value for selecting appropriate USF elevations to provide some level of protection during a large event. In your email below a reference to 99.3m as a minimum USF, can you confirm where this value was determined?

If you would like to discuss further please feel free to contact me.

Brad Cripps, P.Eng.
Project Manager, Infrastructure Approvals
Development Review West
City of Ottawa
110 Laurier Avenue West, Ottawa ON, K1P 1J1
613-580-2424, Ext. 28699
Brad.Cripps@ottawa.ca

From: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Sent: March 18, 2019 3:21 PM
To: Cripps, Brad <brad.cripps@ottawa.ca>
Subject: FW: Comment Clarification - D07-16-190001 & D07-16-18-0027

Hi Brad,

Could you review the below. I was sure that you had spoken to me about this. Any information you can provide them on this?

Thanks
Eric S.

From: Trevor McKay <t.mcKay@novatech-eng.com>
Sent: March 18, 2019 1:55 PM
To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: Comment Clarification - D07-16-190001 & D07-16-18-0027

Eric,

Further to my voicemail early last week, we are requesting clarification on the intent/meaning of comments that we have received in response to the submissions for draft plan approval on the Van Gaal Lands (1039 Terry Fox Drive & 5331 Fernbank Road, D07-16-18-0027) and Bridlewood 3 (866 & 898 Eagleson Road and 1355 & 1365 Terry Fox Drive, D07-16-190001).

We have been informed that you will be the Engineering lead on both files, taking over from Gabrielle Schaeffer.

We have received different information regarding the sanitary sewer outlet conditions on both projects.

1. On the Van Gaal lands project we were informed during the pre-consultation that the sanitary sewer had an overflow at the Hazeldean Pump Station and that an elevation of 99.30 should be used for the minimum USF on site.
2. On the Bridlewood 3 project, we have received a comment (#46) which states that the Hazledean PS does not have an overflow for this branch of the sanitary sewer.

Based on our understanding of the sanitary sewer system, both proposed outlets flow to the trunk sewer on Akerson Road. They share a common outlet from the corner of Cope Drive and Akerson Road to the Hazledean Pump Station.

We would also like clarification on what the requirements relating to the submission of an HGL analysis for the sanitary sewer are for draft approval. We understand the request for an HGL analysis, however it is our suggestion that based on the proposed USF elevations being higher than downstream developments, that this should be a requirement at the detail design phase.

Your clarification is appreciated. We are available should you wish to call and discuss.

Trevor McKay, B.Eng., E.I.T., Project Coordinator | Engineering/Contract Administration
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 291 | Cell: 613.263.9113 | Fax: 613.254.5867

'

'

Serviceability Report

Cavanagh Construction Ltd. / Karam

SOHO West – Rev 3

Project #604-00502

Urban Land
1505 Laperriere Avenue
Ottawa, Ontario
K1Z 7T1
(613) 722-4420

October 31, 2007

Stantec

Stantec

Cavanagh Construction

SOHO Development Phase 1 and 2

DATE: April 2007
REVISION: October 2007
DESIGNED BY: MJS
CHECKED BY: KK

SANITARY SEWER DESIGN SHEET

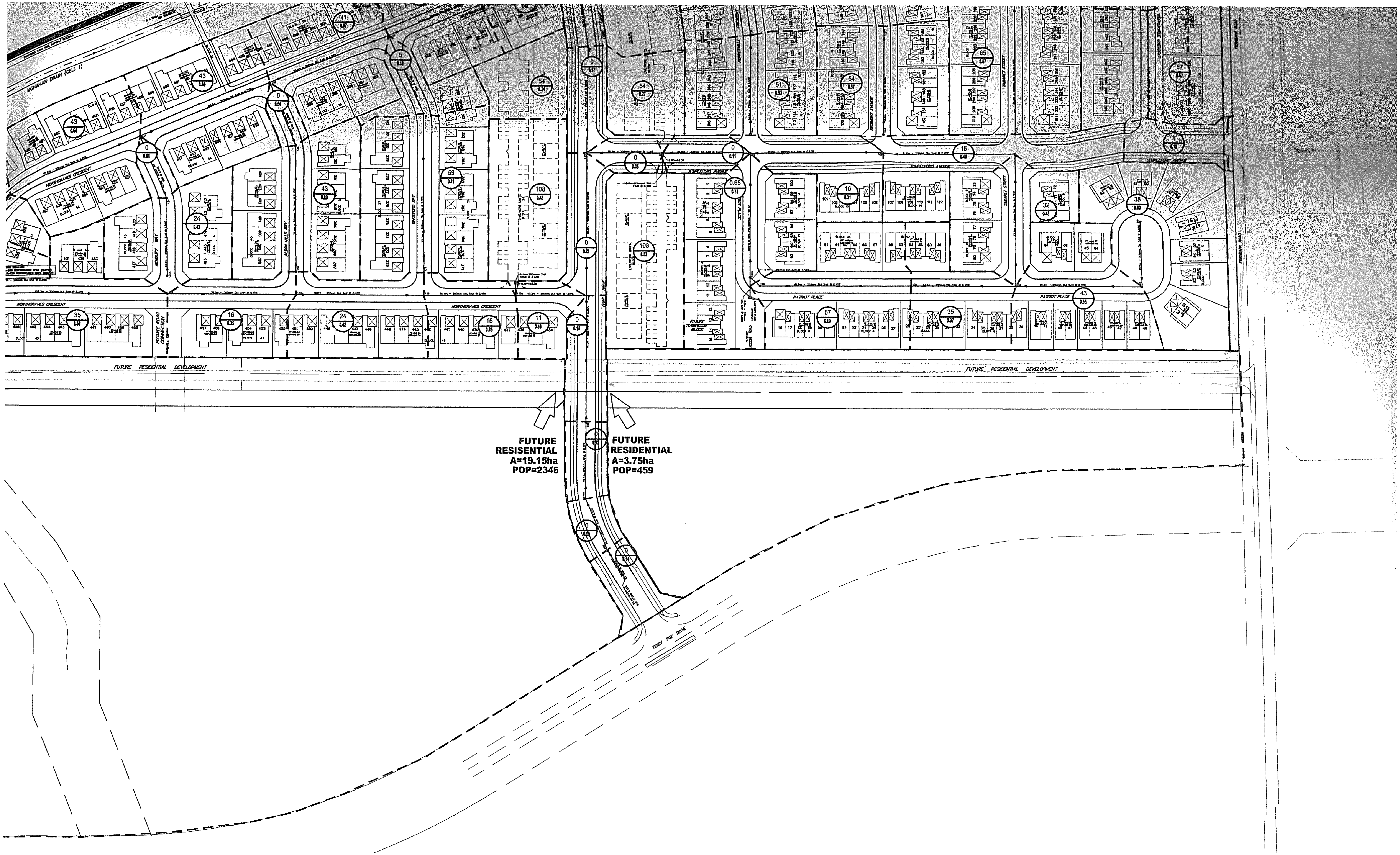
(City of Ottawa)

FILE NUMBER: 1604-00502

DESIGN PARAMETERS

AVG. DAILY FLOW / PERSON =	350	l/p/day	COMMERCIAL	50,000.00	l/Ha/day
MINIMUM VELOCITY =	0.60	m/s	LIGHT INDUSTRIAL	35,000.00	l/Ha/day
n =	0.013		INSTITUTIONAL	0.60	l/s/Ha
MAX PEAK FACTOR =	4.0		INFILTRATION	0.28	l/s/Ha
MIN PEAK FACTOR =	2.4		RESIDENTIAL HARMON PEAKING FACTOR PERSONS/UNIT =		4.0
			KANATA WEST REPORT PERSONS/UNIT =		3.0
Peaking Factor Industrial:	1.5		POPULATION DENSITY PER UNIT =	Single Family =	3.4
Peaking Factor Comm. / Inst.:	1.5			Townhouse =	2.7

LOCATION			RESIDENTIAL AREA AND POPULATION								COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H	TO M.H	AREA (ha)	UNITS Singles	UNITS Towns	UNITS* (KWR)	POP	CUMULATIVE AREA (ha)	CUMULATIVE POP	PEAK FACT	PEAK FLOW (l/s)	AREA (ha)	ACCU AREA (ha)	AREA (ha)	ACCU AREA (ha)	AREA (ha)	ACCU AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU AREA (ha)	INFILT FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP (FULL) (l/s)	(FULL) (m/s)	VEL (ACT.) (m/s)
Phase 1																												
PATRIOT PLACE	101	102	0.80	14	0	38	38	0.80	38	4.00	0.52							0.00	0.80	0.80	0.224	0.84	40.5	200	0.65	26.88	0.84	0.34
PATRIOT PLACE	102	104	0.55	16	0	43	81	1.35	81	4.00	1.31							0.00	0.55	1.35	0.378	1.69	76.9	200	0.45	22.40	0.70	0.36
PATRIOT PLACE	104	105	0.37	13	0	35	116	1.72	116	4.00	1.88							0.00	0.37	1.72	0.482	2.36	64.0	200	0.45	22.40	0.70	0.43
PATRIOT PLACE	105	106	0.60	21	0	57	173	2.32	173	4.00	2.80							0.00	0.60	2.32	0.650	3.45	98.0	200	0.45	22.40	0.70	0.48
PATRIOT PLACE	106	109	0.73	24	0	65	238	3.05	238	4.00	3.86							0.00	0.73	3.05	0.854	4.71	81.0	200	0.45	22.40	0.70	0.53
TABARET STREET	104	107	0.43	12	0	32	32	0.43	32	4.00	0.52							0.00	0.43	0.43	0.120	0.64	83.8	200	0.70	27.84	0.87	0.35
TEMPLEFORD AVENUE	107	108	0.48	6	0	16	48	0.91	48	4.00	0.78							0.00	0.48	0.91	0.255	1.04	81.0	200	0.45	22.40	0.70	0.33
TEMPLEFORD AVENUE	108	109	0.31	6	0	16	64	1.22	64	4.00	1.04							0.00	0.31	1.22	0.342	1.38	81.0	200	0.45	22.40	0.70	0.36
TEMPLEFORD AVENUE	109	110	0.11	0	0	0	0	4.38	302	4.00	4.89							0.00	0.11	4.38	1.226	6.12	53.6	200	0.84	30.72	0.96	0.71
BLOCK 1	110B	110	0.52	40	0	108	108	0.52	108	4.00	1.75							0.00	0.52	0.52	0.146	1.90	111.5	200	0.75	29.12	0.91	0.47
TEMPLEFORD AVENUE	110	147	0.08	0	0	0	0	4.98	410	4.00	6.64							0.00	0.08	4.98	1.394	8.03	46.5	200	1.18	36.48	1.14	0.89
NORTHGRAVES	129	130	0.20	3	0	8	8	0.20	8	4.00	0.13							0.00	0.20	0.20	0.056	0.19	13.0	200	0.65	26.88	0.84	0.00
NORTHGRAVES	130	131	0.59	13	0	35	43	0.79	43	4.00	0.70							0.00	0.59	0.79	0.221	0.92	105.2	200	0.45	22.40	0.70	0.33
NORTHGRAVES	131	132	0.35	6	0	16	59	1.14	59	4.00	0.96							0.00	0.35	1.14	0.319	1.28	78.0	200	0.45	22.40	0.70	0.33
NORTHGRAVES	132	133	0.42	9	0	24	83	1.56	83	4.00	1.34							0.00	0.42	1.56	0.437	1.78	78.0	200	0.45	22.40	0.70	0.36
NORTHGRAVES	133	133A	0.26	6	0	16	99	1.82	99	4.00	1.60							0.00	0.26	1.82	0.510	2.11	55.4	200	0.45	22.40	0.70	0.41
BLOCK 34 ****	133C	133B	0.24	20	0	54	54	0.24	54	4.00	0.88							0.00	0.24	0.24	0.067	0.95	42.5	200	0.65	26.88	0.84	0.34
BLOCK 34 ****	133B	133A	0.48	40	0	108	162	0.72	162	4.00	2.63							0.00	0.48	0.72	0.202	2.83	113.0	200	0.40	21.12	0.66	0.44
NORTHGRAVES	133A	146	0.16	4	0	11	272	2.70	272	4.00	4.41							0.00	0.16	2.70	0.756	5.17	43.2	200	1.09	34.88	1.09	0.75
COPE DR ***	STUB	145B	125.14	0	0	8075	8075	125.14	8075	3.05	99.77			28.72	28.72			17.45	153.86	153.86	43.081	160.30	20.4	525	0.25	223.00	1.00	1.09
COPE DR	145B	145A	0.09	0	0	0	0	125.23	8075	3.05	99.77				28.72			17.45	0.09	153.95	43.106	160.33	34.4	525	0.25	223.00	1.00	1.09
COPE DR	145A	145	0.12	0	0	0	0	125.35	8075	3.05	99.77				28.72			17.45	0.12	154.07	43.140	160.36	46.4	525	0.25	223.00	1.00	1.09
COPE DR	145	146	23.14	0	0	2811	10886	148.49	10886	2.92	128.77				28.72			17.45	23.14	177.21	49.619	195.84	78.0	525	0.25	223.00	1.00	1.14
HENBURY WAY	134A	134	0.43	9	0	24	24	0.43	24	4.00	0.39							0.00	0.43	0.43	0.120	0.51	58.3	200	0.65	26.88	0.84	0.00
HENBURY WAY	134	141	0.06	0	0	0	24	0.49	24	4.00	0.39							0.00	0.06	0.49	0.137	0.53	42.6	200	0.65	26.88	0.84	0.00
ALSON MILLS WAY	135	136	0.68	16	0	43	43	0.68	43	4.00	0.70							0.00	0.68	0.68	0.190	0.89	79.9	200	0.65	26.88	0.84	0.34
ALSON MILLS WAY	136	142	0.06	0	0	0	43	0.74	43	4.00	0.70							0.00	0.06	0.74	0.207	0.91	41.6	200	0.82	30.40	0.95	0.38
WHITEFORD WAY	137	138	0.81	22	0	59	59	0.81	59	4.00	0.96							0.00	0.81	0.81	0.227	1.19	101.1	200	0.78	29.44	0.92	0.43
WHITEFORD WAY	138	143	0.18	2	0	5	64	0.99	64	4.00	1.04							0.00	0.18	0.99	0.277	1.32	54.4	200	0.78	29.44	0.92	0.43
NORTHGRAVES	129	139	0.22	4	0	11	11	0.22	11	4.00	0.18							0.00	0.22	0.22	0.062	0.24	26.7	200	0.65	26.88	0.84	0.00
NORTHGRAVES	139	140	0.29	7	0	19	30	0.51	30	4.00	0.49							0.00	0.29	0.51	0.143	0.63	31.2	200	0.45	22.40	0.70	0.28
NORTHGRAVES	140	141	0.64	16	0	43	73	1.15	73	4.00	1.18							0.00	0.64	8.00	2.240	3.42	87.6	200	0.65	26.88	0.84	0.55
NORTHGRAVES	141	142	0.60	16	0	43	140	2.24	140	4.00	2.27							0.00	0.60	9.09	2.545	4.82	85.7	200	0.35	19.84	0.62	0.50
NORTHGRAVES	142	143	0.57	15	0	41	224	3.55	224	4.00	3.63							0.00	0.57	10.40	2.912	6.54	79.8	200	0.55	24.96	0.78	0.64
NORTHGRAVES	143	144	0.44	11	0	30	318	4.98	318	4.00	5.15							0.00	0.44	11.83	3.312	8.46	60.0	200	0.69	27.84	0.87	0.76
NORTHGRAVES	144	149	0.42	10	0	27	345	5.40	345	4.00	5.59							0.00	0.42	12.25	3.430	9.02	64.5	200	0.69	27.84	0.87	0.77


MONAHAN DRAIN (CELL 1)
NORTHGRAVES CRESCENT
HENBURY WAY
ALSON MILLS WAY
WHITEFORD WAY
TEMPLETON AVENUE
PEPPERVILLE CRESCENT
REDMONT AVENUE
TABARET STREET
PATRIOT PLACE
FERNBANK ROAD
FUTURE ROAD CONNECTION
FUTURE TOWNHOUSE BLOCK
FUTURE ACCESS ROAD
FUTURE RESIDENTIAL DEVELOPMENT
FUTURE RESIDENTIAL DEVELOPMENT
FUTURE
RESISENTIAL
A=19.15ha
POP=2346
FUTURE
RESIDENTIAL
A=3.75ha
POP=459
TERRY FOX DRIVE

Appendix C

Boundary Conditions
5331 Fernbank Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	79	1.31
Maximum Daily Demand	236	3.93
Peak Hour	353	5.89
Fire Flow Demand #1	12,000	200.00
Fire Flow Demand #2	16,000	266.67

Scenario 1

Location

Results – Scenario 1

Connection 1 – Cope Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.4	91.5
Peak Hour	156.4	84.4
Max Day plus Fire 1	152.4	78.8
Max Day plus Fire 2	149.3	74.4

Ground Elevation = 97.0 m

Connection 2 – Patriot Place

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.4	90.4
Peak Hour	156.3	83.2
Max Day plus Fire 1	108.3	14.9
Max Day plus Fire 2	74.8	-32.8

Ground Elevation = 97.8 m

Scenario 2

Location

Results – Scenario 2

Connection 1 – Cope Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.4	91.5
Peak Hour	156.4	84.4
Max Day plus Fire 1	152.4	78.8
Max Day plus Fire 2	151.1	76.9

Ground Elevation = 97.0 m

Connection 2 – Cope Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.4	91.5
Peak Hour	156.4	84.4
Max Day plus Fire 1	152.4	78.7
Max Day plus Fire 2	149.2	74.2

Ground Elevation = 97.0 m

Notes

1. Results for the requested service connection from Overberg Way were not included as it is not possible to service the site
2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

PATRIOT PLACE

FERNBANK ROAD

EOPE DRIVE

TERRY FOX DRIVE

BLDG-A R.F.F.= 15,000 L/MIN

BLDG-B R.F.F.= 16,000 L/MIN

BLDG-C R.F.F.= 14,000 L/MIN

BLDG-D R.F.F.= 15,000 L/MIN

BLDG-E R.F.F.= 15,000 L/MIN

BLDG-F R.F.F.= 14,000 L/MIN

BLDG-G R.F.F.= 14,000 L/MIN

BLDG-H R.F.F.= 13,000 L/MIN

BLDG-J R.F.F.= 14,000 L/MIN

BLDG-K R.F.F.= 12,000 L/MIN

BLDG-L R.F.F.= 13,000L/MIN

BLDG-M R.F.F.= 13,000 L/MIN

BLDG-N R.F.F.= 13,000 L/MIN

BLDG-P R.F.F.= 12,000 L/MIN

BLDG-Q R.F.F.= 14,000L/MIN

BLDG-R R.F.F.= 14,000 L/MIN

H1 H2 H3 H4 H5

Fence 0.04 East

TOS

TOS

100mmCPP T/P=96.70 INV=96.60

LEGEND

- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- R.F.F. REQUIRED FIRE FLOW
- 75m COVERAGE RADIUS
- 150m COVERAGE RADIUS
- H2 PROPOSED HYDRANT
- H1 EXISTING HYDRANT

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA - FERNBANK ZENS

FIRE HYDRANT COVERAGE PLAN

SCALE 1 : 1500 (0, 15, 30, 45, 60)

DATE MAY 2021 | JOB 121011 | FIGURE FIG-1

SHT11X17.DWG 279mmX432mm

Population and Consumption Rate Calculations

Node	Number of Units	Persons per Unit	Population	Consumption Rates (L/s)		
				Average Daily	Maximum Daily	Maximum Hourly
R1	0	2.10	0	0.00	0.00	0.00
R2	0	2.10	0	0.00	0.00	0.00
N1	30	2.10	63	0.20	0.61	0.92
N2	36	2.10	76	0.25	0.74	1.10
N3	36	2.10	76	0.25	0.74	1.10
N4	12	2.10	25	0.08	0.25	0.37
N5	24	2.10	50	0.16	0.49	0.74
N6	12	2.10	25	0.08	0.25	0.37
N7	12	2.10	25	0.08	0.25	0.37
N8	12	2.10	25	0.08	0.25	0.37
N9	18	2.10	38	0.12	0.37	0.55
N10	0	2.10	0	0.00	0.00	0.00
N11	0	2.10	0	0.00	0.00	0.00
N12	0	2.10	0	0.00	0.00	0.00
N13	0	2.10	0	0.00	0.00	0.00
N14	0	2.10	0	0.00	0.00	0.00
Total	**192**	**2.10**	**403**	**1.31**	**3.92**	**5.88**

Water Demand Parameters

Zen Units	2.10	persons/unit
Residential Demand	280	L/c/day
Residential Max Day	3.00	x Avg Day
Residential Peak Hour	4.50	x Avg Day
Zen Fire Flow (small)	267.00	L/s

AVERAGE DAY DEMAND / HIGH PRESSURE CHECK

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi	Age hours
Resvr R1	161.40	-0.76	161.40	0.00	0.00	0.00	0.0
Resvr R2	161.40	-0.54	161.40	0.00	0.00	0.00	0.0
Junc N1	97.02	0.20	161.40	64.38	631.57	91.60	1.1
Junc N2	97.11	0.25	161.40	64.29	630.68	91.47	2.5
Junc N3	97.21	0.25	161.40	64.19	629.70	91.33	3.4
Junc N4	97.40	0.08	161.40	64.00	627.84	91.06	19.5
Junc N5	97.50	0.16	161.40	63.90	626.86	90.92	11.7
Junc N6	97.65	0.08	161.40	63.75	625.39	90.70	8.2
Junc N7	97.62	0.08	161.40	63.78	625.68	90.75	5.5
Junc N8	97.54	0.08	161.40	63.86	626.47	90.86	3.2
Junc N9	97.48	0.12	161.40	63.92	627.06	90.95	1.1
Junc N10	97.10	0.00	161.40	64.30	630.78	91.49	0.1
Junc N11	96.70	0.00	161.40	64.70	634.71	92.06	0.1

Maximum Pressure
Maximum Age

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	84.40	200	110	0.76	0.02	0.01	0.051
Pipe P2	71.30	150	100	0.25	0.01	0.00	0.065
Pipe P3	82.90	200	110	0.31	0.01	0.00	0.053
Pipe P4	73.00	200	110	0.06	0.00	0.00	0.000
Pipe P5	58.40	200	110	-0.02	0.00	0.00	0.000
Pipe P6	70.80	200	110	-0.18	0.01	0.00	0.065
Pipe P7	81.50	200	110	-0.26	0.01	0.00	0.053
Pipe P8	86.80	200	110	-0.34	0.01	0.00	0.058
Pipe P9	100.40	200	110	-0.42	0.01	0.00	0.054
Pipe P10	64.10	200	110	-0.54	0.02	0.00	0.054
Pipe P12	1.00	200	110	-0.54	0.02	0.00	0.000
Pipe P13	1.00	200	110	-0.76	0.02	0.00	0.000

MAXIMUM HOUR DEMAND

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	156.40	-3.44	156.40	0.00	0.00	0.00
Resvr R2	156.40	-2.45	156.40	0.00	0.00	0.00
Junc N1	97.02	0.92	156.39	59.37	582.42	84.47
Junc N2	97.11	1.10	156.38	59.27	581.44	84.33
Junc N3	97.21	1.10	156.39	59.18	580.56	84.20
Junc N4	97.40	0.37	156.39	58.99	578.69	83.93
Junc N5	97.50	0.74	156.39	58.89	577.71	83.79
Junc N6	97.65	0.37	156.39	58.74	576.24	83.58
Junc N7	97.62	0.37	156.39	58.77	576.53	83.62
Junc N8	97.54	0.37	156.39	58.85	577.32	83.73
Junc N9	97.48	0.55	156.40	58.92	578.01	83.83
Junc N10	97.10	0.00	156.40	59.30	581.73	84.37
Junc N12	96.70	0.00	156.40	59.70	585.66	84.94

Minimum Pressure

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	84.4	200	110	3.44	0.11	0.12	0.040
Pipe P2	71.3	150	100	1.10	0.06	0.07	0.055
Pipe P3	82.9	200	110	1.42	0.05	0.02	0.045
Pipe P4	73.0	200	110	0.32	0.01	0.00	0.066
Pipe P5	58.4	200	110	-0.05	0.00	0.00	0.575
Pipe P6	70.8	200	110	-0.79	0.03	0.01	0.049
Pipe P7	81.5	200	110	-1.16	0.04	0.02	0.048
Pipe P8	86.8	200	110	-1.53	0.05	0.03	0.045
Pipe P9	100.4	200	110	-1.90	0.06	0.04	0.044
Pipe P10	64.1	200	110	-2.45	0.08	0.07	0.042
Pipe P12	1.0	200	110	-2.45	0.08	0.07	0.048
Pipe P13	1.0	200	110	-3.44	0.11	0.13	0.043

MAXIMUM DAY + FIRE FLOW DEMAND AT N1

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-174.44	149.20	0.00	0.00	0.00
Resvr R2	151.10	-96.17	151.10	0.00	0.00	0.00
Junc N1	97.02	95.61	141.74	44.72	438.70	63.63
Junc N2	97.11	0.74	141.73	44.62	437.72	63.49
Junc N3	97.21	64.07	141.59	44.38	435.37	63.14
Junc N4	97.40	0.25	142.83	45.43	445.67	64.64
Junc N5	97.50	0.49	143.83	46.33	454.50	65.92
Junc N6	97.65	0.25	145.07	47.42	465.19	67.47
Junc N7	97.62	0.25	146.52	48.90	479.71	69.58
Junc N8	97.54	0.25	148.06	50.52	495.60	71.88
Junc N9	97.48	0.37	149.87	52.39	513.95	74.54
Junc N10	97.10	0.00	151.04	53.94	529.15	76.75
Junc N11	96.86	45.00	150.99	54.13	531.02	77.02
Junc N12	96.70	0.00	149.02	52.32	513.26	74.44
Junc N13	97.12	63.33	148.88	51.76	507.77	73.65
Junc N14	97.65	0.00	148.88	51.23	502.57	72.89

Minimum Pressure
Applied Fire Flow (SUM)

MAXIMUM DAY + FIRE FLOW DEMAND AT N1

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-111.11	3.54	76.69	0.024
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	14.76	0.47	1.82	0.032
Pipe P4	73.00	200	110	-49.31	1.57	17.04	0.027
Pipe P5	58.40	200	110	-49.56	1.58	17.20	0.027
Pipe P6	70.80	200	110	-50.05	1.59	17.52	0.027
Pipe P7	81.50	200	110	-50.30	1.60	17.68	0.027
Pipe P8	86.80	200	110	-50.55	1.61	17.84	0.027
Pipe P9	100.40	200	110	-50.80	1.62	18.00	0.027
Pipe P10	64.10	200	110	-51.17	1.63	18.25	0.027
Pipe P11	30.80	300	120	45.00	0.64	1.70	0.025
Pipe P12	1.00	200	110	-96.17	3.06	58.70	0.025
Pipe P13	1.00	200	110	-174.44	5.55	176.84	0.023
Pipe P14	44.50	300	120	63.33	0.90	3.20	0.023
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N3

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-165.42	149.20	0.00	0.00	0.00
Resvr R2	151.10	-88.53	151.10	0.00	0.00	0.00
Junc N1	97.02	60.61	133.81	36.79	360.91	52.35
Junc N2	97.11	0.74	133.81	36.70	360.03	52.22
Junc N3	97.21	95.74	128.18	30.97	303.82	44.06
Junc N4	97.40	95.25	128.13	30.73	301.46	43.72
Junc N5	97.50	0.49	130.98	33.48	328.44	47.64
Junc N6	97.65	0.25	134.46	36.81	361.11	52.37
Junc N7	97.62	0.25	138.49	40.87	400.93	58.15
Junc N8	97.54	0.25	142.80	45.26	444.00	64.40
Junc N9	97.48	0.37	147.82	50.34	493.84	71.62
Junc N10	97.10	0.00	151.05	53.95	529.25	76.76
Junc N11	96.86	0.00	151.05	54.19	531.60	77.10
Junc N12	96.70	0.00	149.04	52.34	513.46	74.47
Junc N13	97.12	0.00	149.04	51.92	509.34	73.87
Junc N14	97.65	0.00	149.04	51.39	504.14	73.12

Minimum Pressure
Applied Fire Flow (SUM)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-165.42	5.27	160.28	0.023
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	104.07	3.31	67.94	0.024
Pipe P4	73.00	200	110	8.33	0.27	0.63	0.035
Pipe P5	58.40	200	110	-86.92	2.77	48.68	0.025
Pipe P6	70.80	200	110	-87.41	2.78	49.19	0.025
Pipe P7	81.50	200	110	-87.66	2.79	49.45	0.025
Pipe P8	86.80	200	110	-87.91	2.80	49.71	0.025
Pipe P9	100.40	200	110	-88.16	2.81	49.97	0.025
Pipe P10	64.10	200	110	-88.53	2.82	50.36	0.025
Pipe P11	30.80	300	120	0.00	0.00	0.00	0.000
Pipe P12	1.00	200	110	-88.53	2.82	50.36	0.025
Pipe P13	1.00	200	110	-165.42	5.27	160.28	0.023
Pipe P14	44.50	300	120	0.00	0.00	0.00	0.000
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N4

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-147.58	149.20	0.00	0.00	0.00
Resvr R2	151.10	-106.37	151.10	0.00	0.00	0.00
Junc N1	97.02	0.61	136.74	39.72	389.65	56.51
Junc N2	97.11	0.74	136.74	39.63	388.77	56.39
Junc N3	97.21	60.74	126.17	28.96	284.10	41.20
Junc N4	97.40	95.25	122.72	25.32	248.39	36.03
Junc N5	97.50	95.49	122.77	25.27	247.90	35.95
Junc N6	97.65	0.25	127.68	30.03	294.59	42.73
Junc N7	97.62	0.25	133.36	35.74	350.61	50.85
Junc N8	97.54	0.25	139.44	41.90	411.04	59.62
Junc N9	97.48	0.37	146.49	49.01	480.79	69.73
Junc N10	97.10	0.00	151.03	53.93	529.05	76.73
Junc N11	96.86	0.00	151.03	54.17	531.41	77.07
Junc N12	96.70	0.00	149.07	52.37	513.75	74.51
Junc N13	97.12	0.00	149.07	51.95	509.63	73.92
Junc N14	97.65	0.00	149.07	51.42	504.43	73.16

Minimum Pressure
Applied Fire Flow (SUM)

MAXIMUM DAY + FIRE FLOW DEMAND AT N4

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-147.58	4.70	129.75	0.023
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	146.23	4.65	127.56	0.023
Pipe P4	73.00	200	110	85.49	2.72	47.21	0.025
Pipe P5	58.40	200	110	-9.76	0.31	0.85	0.035
Pipe P6	70.80	200	110	-105.25	3.35	69.37	0.024
Pipe P7	81.50	200	110	-105.50	3.36	69.68	0.024
Pipe P8	86.80	200	110	-105.75	3.37	69.98	0.024
Pipe P9	100.40	200	110	-106.00	3.37	70.29	0.024
Pipe P10	64.10	200	110	-106.37	3.39	70.75	0.024
Pipe P11	30.80	300	120	0.00	0.00	0.00	0.000
Pipe P12	1.00	200	110	-106.37	3.39	70.75	0.024
Pipe P13	1.00	200	110	-147.58	4.70	129.75	0.023
Pipe P14	44.50	300	120	0.00	0.00	0.00	0.000
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N5

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-122.77	149.20	0.00	0.00	0.00
Resvr R2	151.10	-114.51	151.10	0.00	0.00	0.00
Junc N1	97.02	0.61	140.34	43.32	424.97	61.64
Junc N2	97.11	0.74	140.34	43.23	424.09	61.51
Junc N3	97.21	0.74	132.85	35.64	349.63	50.71
Junc N4	97.40	43.58	126.32	28.92	283.71	41.15
Junc N5	97.50	95.49	124.05	26.55	260.46	37.78
Junc N6	97.65	95.25	124.24	26.59	260.85	37.83
Junc N7	97.62	0.25	130.76	33.14	325.10	47.15
Junc N8	97.54	0.25	137.73	40.19	394.26	57.18
Junc N9	97.48	0.37	145.82	48.34	474.22	68.78
Junc N10	97.10	0.00	151.02	53.92	528.96	76.72
Junc N11	96.86	0.00	151.02	54.16	531.31	77.06
Junc N12	96.70	0.00	149.11	52.41	514.14	74.57
Junc N13	97.12	0.00	149.11	51.99	510.02	73.97
Junc N14	97.65	0.00	149.11	51.46	504.82	73.22

Minimum Pressure
Applied Fire Flow (SUM)

MAXIMUM DAY + FIRE FLOW DEMAND AT N5

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-122.77	3.91	92.27	0.024
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	121.42	3.86	90.40	0.024
Pipe P4	73.00	200	110	120.68	3.84	89.38	0.024
Pipe P5	58.40	200	110	77.10	2.45	38.98	0.025
Pipe P6	70.80	200	110	-18.39	0.59	2.74	0.031
Pipe P7	81.50	200	110	-113.64	3.62	79.96	0.024
Pipe P8	86.80	200	110	-113.89	3.63	80.29	0.024
Pipe P9	100.40	200	110	-114.14	3.63	80.62	0.024
Pipe P10	64.10	200	110	-114.51	3.64	81.10	0.024
Pipe P11	30.80	300	120	0.00	0.00	0.00	0.000
Pipe P12	1.00	200	110	-114.51	3.64	81.10	0.024
Pipe P13	1.00	200	110	-122.77	3.91	92.27	0.024
Pipe P14	44.50	300	120	0.00	0.00	0.00	0.000
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N6

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-122.77	149.20	0.00	0.00	0.00
Resvr R2	151.10	-114.51	151.10	0.00	0.00	0.00
Junc N1	97.02	0.61	140.34	43.32	424.97	61.64
Junc N2	97.11	0.74	140.34	43.23	424.09	61.51
Junc N3	97.21	0.74	132.85	35.64	349.63	50.71
Junc N4	97.40	43.58	126.32	28.92	283.71	41.15
Junc N5	97.50	95.49	124.05	26.55	260.46	37.78
Junc N6	97.65	95.25	124.24	26.59	260.85	37.83
Junc N7	97.62	0.25	130.76	33.14	325.10	47.15
Junc N8	97.54	0.25	137.73	40.19	394.26	57.18
Junc N9	97.48	0.37	145.82	48.34	474.22	68.78
Junc N10	97.10	0.00	151.02	53.92	528.96	76.72
Junc N11	96.86	0.00	151.02	54.16	531.31	77.06
Junc N12	96.70	0.00	149.11	52.41	514.14	74.57
Junc N13	97.12	0.00	149.11	51.99	510.02	73.97
Junc N14	97.65	0.00	149.11	51.46	504.82	73.22

Minimum Pressure
Applied Fire Flow (SUM)

MAXIMUM DAY + FIRE FLOW DEMAND AT N6

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-122.77	3.91	92.27	0.024
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	121.42	3.86	90.40	0.024
Pipe P4	73.00	200	110	120.68	3.84	89.38	0.024
Pipe P5	58.40	200	110	77.10	2.45	38.98	0.025
Pipe P6	70.80	200	110	-18.39	0.59	2.74	0.031
Pipe P7	81.50	200	110	-113.64	3.62	79.96	0.024
Pipe P8	86.80	200	110	-113.89	3.63	80.29	0.024
Pipe P9	100.40	200	110	-114.14	3.63	80.62	0.024
Pipe P10	64.10	200	110	-114.51	3.64	81.10	0.024
Pipe P11	30.80	300	120	0.00	0.00	0.00	0.000
Pipe P12	1.00	200	110	-114.51	3.64	81.10	0.024
Pipe P13	1.00	200	110	-122.77	3.91	92.27	0.024
Pipe P14	44.50	300	120	0.00	0.00	0.00	0.000
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N11

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-126.03	149.20	0.00	0.00	0.00
Resvr R2	151.10	-127.92	151.10	0.00	0.00	0.00
Junc N1	97.02	95.61	146.32	49.30	483.63	70.15
Junc N2	97.11	0.74	146.32	49.21	482.75	70.02
Junc N3	97.21	0.74	146.90	49.69	487.46	70.70
Junc N4	97.40	0.25	147.43	50.03	490.79	71.18
Junc N5	97.50	0.49	147.86	50.36	494.03	71.65
Junc N6	97.65	0.25	148.39	50.74	497.76	72.19
Junc N7	97.62	0.25	149.02	51.40	504.23	73.13
Junc N8	97.54	0.25	149.69	52.15	511.59	74.20
Junc N9	97.48	0.37	150.48	53.00	519.93	75.41
Junc N10	97.10	0.00	151.00	53.90	528.76	76.69
Junc N11	96.86	95.00	150.79	53.93	529.05	76.73
Junc N12	96.70	0.00	149.10	52.40	514.04	74.56
Junc N13	97.12	60.00	148.97	51.85	508.65	73.77
Junc N14	97.65	0.00	148.97	51.32	503.45	73.02

Minimum Pressure
Applied Fire Flow (SUM)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-66.03	2.10	29.26	0.026
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	-30.32	0.97	6.92	0.029
Pipe P4	73.00	200	110	-31.06	0.99	7.24	0.029
Pipe P5	58.40	200	110	-31.31	1.00	7.35	0.029
Pipe P6	70.80	200	110	-31.80	1.01	7.56	0.029
Pipe P7	81.50	200	110	-32.05	1.02	7.67	0.029
Pipe P8	86.80	200	110	-32.30	1.03	7.78	0.029
Pipe P9	100.40	200	110	-32.55	1.04	7.89	0.029
Pipe P10	64.10	200	110	-32.92	1.05	8.06	0.029
Pipe P11	30.80	300	120	95.00	1.34	6.78	0.022
Pipe P12	1.00	200	110	-127.92	4.07	99.57	0.024
Pipe P13	1.00	200	110	-126.03	4.01	96.86	0.024
Pipe P14	44.50	300	120	60.00	0.85	2.89	0.024
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N13

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-133.16	149.20	0.00	0.00	0.00
Resvr R2	151.10	-120.79	151.10	0.00	0.00	0.00
Junc N1	97.02	60.61	148.09	51.07	501.00	72.66
Junc N2	97.11	0.74	148.08	50.97	500.02	72.52
Junc N3	97.21	0.74	148.44	51.23	502.57	72.89
Junc N4	97.40	0.25	148.76	51.36	503.84	73.08
Junc N5	97.50	0.49	149.03	51.53	505.51	73.32
Junc N6	97.65	0.25	149.36	51.71	507.28	73.57
Junc N7	97.62	0.25	149.75	52.13	511.40	74.17
Junc N8	97.54	0.25	150.18	52.64	516.40	74.90
Junc N9	97.48	0.37	150.68	53.20	521.89	75.69
Junc N10	97.10	0.00	151.01	53.91	528.86	76.70
Junc N11	96.86	95.00	150.80	53.94	529.15	76.75
Junc N12	96.70	0.00	149.09	52.39	513.95	74.54
Junc N13	97.12	95.00	148.79	51.67	506.88	73.52
Junc N14	97.65	0.00	148.79	51.14	501.68	72.76

Minimum Pressure
Applied Fire Flow (SUM)

MAXIMUM DAY + FIRE FLOW DEMAND AT N13

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	-38.16	1.21	10.60	0.028
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	-23.19	0.74	4.21	0.030
Pipe P4	73.00	200	110	-23.93	0.76	4.47	0.030
Pipe P5	58.40	200	110	-24.18	0.77	4.55	0.030
Pipe P6	70.80	200	110	-24.67	0.79	4.73	0.030
Pipe P7	81.50	200	110	-24.92	0.79	4.81	0.030
Pipe P8	86.80	200	110	-25.17	0.80	4.90	0.030
Pipe P9	100.40	200	110	-25.42	0.81	4.99	0.030
Pipe P10	64.10	200	110	-25.79	0.82	5.13	0.030
Pipe P11	30.80	300	120	95.00	1.34	6.78	0.022
Pipe P12	1.00	200	110	-120.79	3.84	89.54	0.024
Pipe P13	1.00	200	110	-133.16	4.24	107.25	0.023
Pipe P14	44.50	300	120	95.00	1.34	6.78	0.022
Pipe P15	77.50	300	120	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N14

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	149.20	-182.53	149.20	0.00	0.00	0.00
Resvr R2	151.10	-21.42	151.10	0.00	0.00	0.00
Junc N1	97.02	10.61	149.06	52.04	510.51	74.04
Junc N2	97.11	0.74	149.05	51.94	509.53	73.90
Junc N3	97.21	0.74	149.29	52.08	510.90	74.10
Junc N4	97.40	0.25	149.52	52.12	511.30	74.16
Junc N5	97.50	0.49	149.70	52.20	512.08	74.27
Junc N6	97.65	0.25	149.94	52.29	512.96	74.40
Junc N7	97.62	0.25	150.21	52.59	515.91	74.83
Junc N8	97.54	0.25	150.51	52.97	519.64	75.37
Junc N9	97.48	0.37	150.86	53.38	523.66	75.95
Junc N10	97.10	0.00	151.10	54.00	529.74	76.83
Junc N11	96.86	0.00	151.10	54.24	532.09	77.17
Junc N12	96.70	0.00	149.01	52.31	513.16	74.43
Junc N13	97.12	95.00	147.92	50.80	498.35	72.28
Junc N14	97.65	95.00	147.39	49.74	487.95	70.77

Minimum Pressure
Applied Fire Flow (SUM)

MAXIMUM DAY + FIRE FLOW DEMAND AT N14

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	95.00	200	110	7.47	0.24	0.52	0.036
Pipe P2	71.30	150	100	0.74	0.04	0.03	0.058
Pipe P3	82.90	200	110	-18.82	0.60	2.86	0.031
Pipe P4	73.00	200	110	-19.56	0.62	3.08	0.031
Pipe P5	58.40	200	110	-19.81	0.63	3.15	0.031
Pipe P6	70.80	200	110	-20.30	0.65	3.29	0.031
Pipe P7	81.50	200	110	-20.55	0.65	3.37	0.031
Pipe P8	86.80	200	110	-20.80	0.66	3.45	0.031
Pipe P9	100.40	200	110	-21.05	0.67	3.52	0.031
Pipe P10	64.10	200	110	-21.42	0.68	3.64	0.031
Pipe P11	30.80	300	120	0.00	0.00	0.00	0.000
Pipe P12	1.00	200	110	-21.42	0.68	3.64	0.031
Pipe P13	1.00	200	110	-182.53	5.81	192.32	0.022
Pipe P14	44.50	300	120	190.00	2.69	24.47	0.020
Pipe P15	77.50	300	120	95.00	1.34	6.78	0.022

MAXIMUM DAY + FIRE FLOW DEMAND SUMMARY

Maximum day plus fire flow demand was modeled for each node.
The following is a summary of the minimum pressures that occurred for each operating condition.

Fire at Junction	Demand (L/s)			Minimum Pressure			
	Maximum Daily	Fire Flow	Max Day + Fire	(m)	kPa	psi	Node
N1	0.61	266.66	267.27	44.38	435.37	63.14	N3
N3	0.74	250.00	250.74	30.73	301.46	43.72	N4
N4	0.25	250.00	250.25	26.31	258.10	37.43	N4
N5	0.49	233.33	233.82	26.55	260.46	37.78	N5
N6	0.25	233.33	233.58	26.55	260.46	37.78	N5
N11	0.00	250.00	250.00	49.21	482.75	70.02	N2
N13	0.00	250.00	250.00	50.97	500.02	72.52	N2
N14	0.00	200.00	200.00	49.74	487.95	70.77	N14

PATRIOT PLACE

FERNBANK ROAD

EOPE DRIVE

TERRY FOX DRIVE

EXISTING HYDRANT NODES AND PIPE SEGMENTS USED FOR FIREFLOW PURPOSES ONLY

CONNECTION TO EXISTING 300mmØ WATERMAIN

CONNECTION TO EXISTING 300mmØ WATERMAIN

EXISTING HYDRANT NODES AND PIPE SEGMENTS USED FOR FIREFLOW PURPOSES ONLY

Fence 0.04 East

100mmCPP T/P=96.70 INV=96.60

600mmRCSP T/P=96.45 INV=90.50

600mmRCSP T/P=96.43 INV=89.83

BLDG-A R.F.F.= 15,000 L/MIN

BLDG-B R.F.F.= 16,000 L/MIN

BLDG-C R.F.F.= 14,000 L/MIN

BLDG-D R.F.F.= 15,000 L/MIN

BLDG-E R.F.F.= 15,000 L/MIN

BLDG-F R.F.F.= 14,000 L/MIN

BLDG-G R.F.F.= 14,000 L/MIN

BLDG-H R.F.F.= 13,000 L/MIN

BLDG-J R.F.F.= 14,000 L/MIN

BLDG-K R.F.F.= 12,000 L/MIN

BLDG-L R.F.F.= 13,000L/MIN

BLDG-M R.F.F.= 13,000 L/MIN

BLDG-N R.F.F.= 13,000 L/MIN

BLDG-P R.F.F.= 12,000 L/MIN

BLDG-Q R.F.F.= 14,000L/MIN

BLDG-R R.F.F.= 14,000 L/MIN

LEGEND

- SITE BOUNDARY
- P5 — PROPOSED 200mm WATERMAIN
- P5 — PROPOSED 150mm WATERMAIN
- P5 — EXISTING WATERMAIN
- (1) — PROPOSED NODE AND ID NUMBER
- (13) — EXISTING HYDRANT NODE AND ID NUMBER
- R1 — EXISTING RESERVOIR AND ID NUMBER
- BLDG-P R.F.F.= 12,000 L/MIN — REQUIRED FIRE FLOW

NOVATECH
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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
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Website www.novatech-eng.com

CITY OF OTTAWA
FERNBANK ZENS

PROPOSED WATERMAIN LAYOUT AND NODES

SCALE 1 : 1500 (0, 15, 30, 45, 60)

DATE MAY 2021 | JOB 121011 | FIGURE FIG-WM

SHT11X17.DWG - 279mmX432mm

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building A
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	30.1- 45 m		5%	**4,590**
		East Side	10.1 - 20 m		15%	
		South Side	20.1 - 30 m		10%	
		West Side	10.1 - 20 m		15%	
				Cumulative Total	**45%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**15,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	**L/s**	**250**
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	45%	
Total Fire Flow	15,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building B
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**5,610**
		East Side	10.1 - 20 m		15%	
		South Side	10.1 - 20 m		15%	
		West Side	10.1 - 20 m		15%	
				Cumulative Total	**55%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**16,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**267**
				or	USGPM	4,227
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3.5
		Required Volume of Fire Flow (m^3)			m^3	3360

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	55%	
Total Fire Flow	16,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

	Construction Material	
1	Generally most OBC Part 9 Buildings Only Use if can be confirmed with client/architect Only Use if can be confirmed with client/architect	
	Floor Area	
2	If considered gross floor area, then enter 1 floor/storey If Fire wall, then reduce footprint accordingly	

Reductions or Surcharges

	Occupancy hazard reduction or surcharge	
3	Residential - with no garage - Not Typical Residential - with garage General Commercial **- Generally, for commercial buildings no reduction** Check usage with FUS Check usage with FUS	
	Sprinkler Reduction	
4	Is the building sprinklered? Only Use if can be confirmed with client/architect Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)	
	Exposure Surcharge (cumulative %)	
5	For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada	

Results

6	NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min If IGPM is needed, divide USGPM by 1.20095	
7	For Rural areas, or where required	

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building C
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	10.1 - 20 m		15%	**4,080**
		East Side	10.1 - 20 m		15%	
		South Side	20.1 - 30 m		10%	
		West Side	> 45.1m		0%	
				Cumulative Total	**40%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	40%	
Total Fire Flow	14,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building D
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**5,100**
		East Side	10.1 - 20 m		15%	
		South Side	10.1 - 20 m		15%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**50%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**15,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**250**
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	50%	
Total Fire Flow	15,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building E
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	10.1 - 20 m		15%	**5,100**
		East Side	10.1 - 20 m		15%	
		South Side	20.1 - 30 m		10%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**50%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**15,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**250**
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	50%	
Total Fire Flow	15,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building F
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**4,080**
		East Side	10.1 - 20 m		15%	
		South Side	10.1 - 20 m		15%	
		West Side	> 45.1m		0%	
				Cumulative Total	**40%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	40%	
Total Fire Flow	14,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building G
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	10.1 - 20 m		15%	**4,080**
		East Side	10.1 - 20 m		15%	
		South Side	20.1 - 30 m		10%	
		West Side	> 45.1m		0%	
				Cumulative Total	**40%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	40%	
Total Fire Flow	14,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Large 12 Unit Zen Building H
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	440			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,320**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**3,060**
		East Side	10.1 - 20 m		15%	
		South Side	30.1- 45 m		5%	
		West Side	> 45.1m		0%	
				Cumulative Total	**30%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**13,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**217**
				or	USGPM	3,435
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1950

FUS - Fire Flow Calculations - User Guide

Novatech Project #:	121011
Project Name:	Zens 5331 Fernbar
Date:	5/10/2021
Input By:	Drew Blair
Reviewed By:	Steve Zorgel

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,320	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	30%	
Total Fire Flow	13,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building J
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	30.1- 45 m		5%	**4,080**
		East Side	10.1 - 20 m		15%	
		South Side	> 45.1m		0%	
		West Side	3.1 - 10 m		20%	
				Cumulative Total	**40%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011
Project Name: Zens 5331 Fernbar
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	40%	
Total Fire Flow	14,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building K
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**2,040**
		East Side	3.1 - 10 m		20%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**20%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**12,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**200**
				or	USGPM	3,170
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1800

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	20%	
Total Fire Flow	12,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building L
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**3,060**
		East Side	20.1 - 30 m		10%	
		South Side	20.1 - 30 m		10%	
		West Side	> 45.1m		0%	
				Cumulative Total	**30%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**13,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**217**
				or	USGPM	3,435
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1950

FUS - Fire Flow Calculations - User Guide

Novatech Project #:	121011
Project Name:	Zens 5331 Fernbar
Date:	5/10/2021
Input By:	Drew Blair
Reviewed By:	Steve Zorgel

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	30%	
Total Fire Flow	13,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building M
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	30.1- 45 m		5%	**2,550**
		East Side	20.1 - 30 m		10%	
		South Side	20.1 - 30 m		10%	
		West Side	> 45.1m		0%	
				Cumulative Total	**25%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**13,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**217**
				or	USGPM	3,435
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1950

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	25%	
Total Fire Flow	13,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building N
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**2,550**
		East Side	30.1- 45 m		5%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**25%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**13,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**217**
				or	USGPM	3,435
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1950

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name: Zens 5331 Fernbar	
Date: 5/10/2021	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By: Drew Blair	
Reviewed By: Steve Zorgel	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	25%	
Total Fire Flow	13,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building P
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	30.1- 45 m		5%	**1,530**
		East Side	30.1- 45 m		5%	
		South Side	> 45.1m		0%	
		West Side	30.1- 45 m		5%	
				Cumulative Total	**15%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**12,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**200**
				or	USGPM	3,170
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1800

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011
Project Name: Zens 5331 Fernbar
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	15%	
Total Fire Flow	12,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building Q
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	10.1 - 20 m		15%	**4,080**
		East Side	10.1 - 20 m		15%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**40%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

FUS - Fire Flow Calculations - User Guide

Novatech Project #: 121011
Project Name: Zens 5331 Fernbar
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	40%	
Total Fire Flow	14,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121011
Project Name: Zens 5331 Fernbank Road
Date: 5/10/2021
Input By: Drew Blair
Reviewed By: Steve Zorgel

Legend: Input by User; No Information or Input Required

Building Description: 3 Storey - Small 12 Unit Zen Building R
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	420			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**1,260**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**3,570**
		East Side	10.1 - 20 m		15%	
		South Side	10.1 - 20 m		15%	
		West Side	30.1- 45 m		5%	
				Cumulative Total	**35%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

FUS - Fire Flow Calculations - User Guide

Novatech Project #:	121011
Project Name:	Zens 5331 Fernbar
Date:	5/10/2021
Input By:	Drew Blair
Reviewed By:	Steve Zorgel

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Wood frame	
Area	1,260	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	0%	
Exposure Surcharge	35%	
Total Fire Flow	14,000	L/min

Project Manager Review
Date: _____
Name: _____
Signature: _____

Base Fire Flow

Construction Material

1 Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

Floor Area

2 If considered gross floor area, then enter 1 floor/storey
If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

Occupancy hazard reduction or surcharge

3 Residential - with no garage - Not Typical
Residential - with garage
General Commercial **- Generally, for commercial buildings no reduction**
Check usage with FUS
Check usage with FUS

Sprinkler Reduction

4 Is the building sprinklered?
Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

Exposure Surcharge (cumulative %)

5 For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

Appendix D

EROSION AND SEDIMENT CONTROL PLAN, MONITORING, AND MEASURES

Scope of Work

The work under the applicable items includes the preparation, implementation and monitoring of an Erosion and Sediment Control Plan to prevent sediment-laden runoff resulting from the Contractor's construction operations from entering all sewers and watercourses both within and downstream from the Working Area. The plan shall include management and monitoring of water discharged from dewatering operations. The specification is limited to the management of sediment laden water and the management of contaminants such as hydrocarbons and volatile organic compounds present within groundwater at the site shall be managed as described elsewhere in the contract documents.

General

The Contractor acknowledges that surface erosion and sediment runoff resulting from construction operations has potential to cause a detrimental impact to any downstream watercourse, and that all construction operations that may impact upon water quality shall be carried out in a manner that strictly meets the requirements of all applicable legislation and regulations.

Accordingly, the Contractor shall be responsible for determining and conforming to the requirements of the Ontario Ministry of the Environment (MOE), the Ontario Ministry of Natural Resources, the City of Ottawa, applicable Conservation Authorities and any other Governmental Regulatory Agencies (collectively "Regulatory Agencies") having jurisdiction in the Working Area or over any potentially affected watercourses.

Erosion and Sediment Control Plan

Before commencing the Work, the Contractor shall submit to the Contract Administrator six copies of a detailed Erosion and Sediment Control Plan. The ESC Plan will consist of a written description and detailed drawings indicating the on-site activities and measures to be used to control erosion and sediment movement for each step of the Work. The written description shall be signed by, and the drawings shall bear the stamp and signature of a qualified Professional Engineer licensed in Ontario, herein designated as the Engineer of Record (EOR).

The Contractor acknowledges that the scheduling of the implementation of erosion and sediment controls is the key component for successful sediment control. Accordingly, the ESC Plan will contain a detailed schedule which identifies the following:

- Phasing of the steps for the installation of all control measures.
- Inspection, monitoring and maintenance of all control measures during construction.

EROSION AND SEDIMENT CONTROL PLAN, MONITORING, AND MEASURES

- Phasing of the removal and disposal of the control measures.

The Contractor acknowledges that no one measure is likely to be 100% effective for erosion protection and controlling sediment runoff and water discharges from the site. Therefore, where necessary the ESC Plan will implement sequential measures arranged in such a manner so as to mitigate sediment release from construction operations and achieve specific maximum permitted criteria where applicable. Suggested on-site measures may include, but shall not be limited to, the following methods: sediment ponds, filter bags, pump filters, settling tanks, silt fences, straw bales, filter cloths, check dams and/or berms, or other recognized technologies and methods available at the time of construction. Specific measures shall be installed in accordance with the requirements of OPSS 805 where appropriate, or in accordance with manufacturer's recommendations.

Inspection and Monitoring of Mitigation Measures

The Contractor shall be solely responsible for inspecting, monitoring and maintaining the effectiveness of the ESC Plan upon implementation. The Contractor shall submit to the Contract Administrator weekly inspection reports demonstrating the performance of the installed measures, identifying deficiencies and indentifying required maintenance issues. These reports shall be prepared, signed by the EOR and provided to the Contract Administrator within 48 hours of the inspection.

- Maintenance issues are defined as any measure which is not functioning to the satisfaction of the EOR and in the opinion of the EOR may be repaired by the contractor with subsequent re-inspection at the next scheduled EOR site inspection.
- Deficiencies are defined as any measure or lack of measure which has potential to cause an adverse environmental impact at the site given the current/forecasted conditions and schedule of the work.

Maintenance issues which have previously been identified but not adequately corrected shall be considered deficiencies.

Deficiencies shall be immediately corrected. Corrective actions shall be re-inspected and documented by the EOR. Re-inspection reports shall be specific to the deficiency observed and may be written field reports.

EOR monitoring reports submitted shall include:

- The date and time of the inspection and monitoring.
- General description of the mitigating measures being utilized at the site.
- Confirmation as to the effectiveness of the measures inspected.

EROSION AND SEDIMENT CONTROL PLAN, MONITORING, AND MEASURES

- Description of any maintenance issue which requires minor repair, improvement or maintenance.
- Description of any deficiency observed including timeline for correction and re-inspection.
- Deficiency re-inspection reports outstanding for the site.

The Contractor shall notify the Contract Administrator in all situations where a regulatory agency has identified deficiencies in erosion/sediment control measures, quality of runoff or quality of water quality discharged from dewatering operation.

Where in the opinion of the Contract Administrator either the proof of performance submitted is or the measures implemented are considered inadequate, the Contractor shall have the EOR review measures in the presence of the Contract Administrator within 24 hours of being notified in writing.

The Contractor shall monitor all weather forecasts and schedule the Work in order to minimize the risk of sediment-laden water from entering any watercourse or sewer system. The ESC Plan shall contain a Contingency Plan to include the provision of additional labour, equipment or materials to install additional control measures, and detail an emergency response plan in case of an accidental event. As such, the Contractor shall have additional control materials on site at all times which are easily accessible and may be implemented at a moment's notice.

Contractor's Responsibilities

The Contractor shall ensure that all workers, including sub-contractors, in the Working Area are aware of the importance of the erosion and sediment control measures and informed of the consequences of the failure to comply with the requirements of all Regulatory Agencies and the specifications detailed herein.

The Contractor shall periodically, and when requested by the Contract Administrator or EOR, clean out accumulated sediment deposits as required at the sediment control devices, including those deposits that may originate from outside the construction area. Accumulated sediment shall be removed in such a manner that prevents the deposition of this material into any sewer or watercourse and avoids damage to the control measure. The sediment shall be removed from the site at the Contractor's expense and managed in compliance with the requirements for excess earth material, as specified elsewhere in the Contract.

The Contractor shall immediately report to applicable regulatory agencies and the Contract Administrator any accidental discharges of sediment material into either the watercourse or the storm sewer system. Failure to report will be constitute a breach of this specification and the Contractor may also be subject to the penalties imposed by any

EROSION AND SEDIMENT CONTROL PLAN, MONITORING, AND MEASURES

applicable Regulatory Agency. Appropriate response measures, including any repairs to existing control measures or the implementation of additional control measures, shall be carried out by the Contractor without delay.

The sediment control measures shall be removed when, in the opinion of the EOR, the measure(s) is no longer required. No control measure may be permanently removed without prior written authorization from the EOR. All sediment and erosion control measures shall be removed in a manner that avoids the entry of sediment or debris into any sewer or watercourse within or downstream of the Working Area. All accumulated sediment shall be removed from the Working Area at the Contractor's expense and managed in compliance with the requirements for excess earth material, as specified elsewhere in the Contract. Any seeding and mulching, temporary cover, sodding or original turf cover that is disturbed by the removal of the control measures and accumulated sediment, shall be brought to final grade and restored. Payment for the supply and placing of ground cover at these locations shall be made under the applicable items listed elsewhere in the Contract.

Where, in the opinion of either the Contract Administrator or a Regulatory Agency, any of the terms specified herein have either not been complied with or not performed in a suitable manner, the Contract Administrator or Regulatory Agency has the right to immediately withdraw its permission to continue the work but may renew its permission upon being satisfied that the defaults and/or deficiencies in the performance of this specification by the Contractor have been remedied. No compensation will be made to the Contractor for the withdrawal of permission to do the work resulting from non-compliance with the requirements of this specification and the Regulatory Agencies.

In addition to any other remedy and/or penalty provided by law, where there has been default or non-compliance with any of the terms specified herein and the Contractor refuses to perform or rectify same within forty-eight (48) hours of the receipt of the written demand of the Contract Administrator to do so, the Owner is hereby entitled to enter upon the Working Area and either complete the work in conformity with the Contract or have the work done that it considers necessary to complete the Work to its intended condition, whichever, in the Owner's sole opinion, is the most reasonable course of action. The Contractor and the Owner further agree that the costs incurred for any such work shall be retained by the Owner from monies otherwise due to the Contractor.

Monitoring of Water Quality Impacts and Point Source Discharges

The Contractor shall monitor runoff quality and quantity of water discharged from dewatering operations. The work shall include turbidity monitoring of impacts to watercourses (upstream vs downstream conditions), total suspended solids (TSS) monitoring of point sources such as those from dewatering operations. Discharge shall be in accordance with site specific constraints, regulatory requirements and sewer use bylaw

EROSION AND SEDIMENT CONTROL PLAN, MONITORING, AND MEASURES

requirements. Where no specific criteria has otherwise been identified, the contractor shall meet the following discharge objective.

Source	Objective	Monitoring Frequency (min)
Watercourse Impacts	Downstream turbidity not to exceed upstream levels by greater than 25%	Minimum of daily for first three days of operation Minimum of twice weekly on an ongoing basis Daily for situations where the work is being conducted within 20 metres of a watercourse.
Discharge from Dewatering Operations	TSS maximum level of 25 mg/L	Minimum of daily for first three days of operation Minimum of twice weekly on an ongoing basis

Monitoring frequency to increase where scheduled construction operations have potential to impair water quality.

Mitigation and Action by Contractor Where Monitoring Indicates Water Impacts or Discharges Over Criteria or Objectives

Where site specific criteria or objectives are not attained, the Contractor and/or EOR shall immediately notify applicable regulatory agency of the monitoring results and possible impacts to sewers and watercourses. The Contractor shall implement an Action/Mitigation Plan acceptable to the EOR and applicable regulatory agency prior to continuing or resuming construction activities.

Measurement and Basis of Payment

Item – Erosion and Sediment Control Plan and Monitoring

Payment at the Contract price for the item “Erosion and Sediment Control Plan and Monitoring” shall be full compensation for the preparation and monitoring of the Erosion and Sediment Control Plan.

Payment shall be based upon the following schedule:

a) 25% upon satisfactory submission and implementation of the ESC Plan; and,
b) 75% pro-rated into equal payments over the term of the contract.

EROSION AND SEDIMENT CONTROL PLAN, MONITORING, AND MEASURES

This payment schedule may only be modified as agreed upon in writing between the Contractor and the Contract Administrator.

Item – Erosion and Sediment Control Measures

Payment at the Contract price for the item “Erosion and Sediment Control Measures” shall be full compensation for the implementation and maintenance of erosion and sediment control measures required for the site, and shall include all labour, equipment and materials to supply, construct, monitor and maintain all erosion and sediment control measures detailed therein.

Payment shall be based upon the following schedule:

a) 20% upon satisfactory installation of the control measures;
b) 70% pro-rated into equal payments over the term of the contract; and,
c) 10% upon successful completion and removal of the ESC Plan protection measures.

This payment schedule may only be modified as agreed upon in writing between the Contractor and the Contract Administrator.

Warrant: For work which is conducted in close proximity to watercourses or environmentally sensitive areas.

Appendix E

Drew Blair

From: Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
Sent: Wednesday, May 12, 2021 9:50 AM
To: Drew Blair
Cc: Marc St.Pierre
Subject: RE: Pre-Consultation Follow-Up: 5331 Fernbank

Hi Drew,

Please go ahead and use the JFSA figure.

Thanks,

From: Kuruvilla, Santhosh
Sent: May 11, 2021 2:44 PM
To: Drew Blair <D.Blair@novatech-eng.com>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: Pre-Consultation Follow-Up: 5331 Fernbank

Hi Drew,

Thanks for your quick response.

I will check with my colleague who gave me the quantity control criteria for this site (70L/S/Ha) and get back to you.

Thanks,

Santhosh

From: Drew Blair <D.Blair@novatech-eng.com>
Sent: May 11, 2021 2:14 PM
To: Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: Pre-Consultation Follow-Up: 5331 Fernbank

It's not clearly spelled out in the text of the 2019 JFSA report. It is contained in the modelling files (provided by Stantec) that JFSA used for the overall Monahan Drain analysis including our site. I have attached the email we received from JFSA that confirms the 85L/s/Ha release rate for our site.

Please let us know if you need anything further.

Thanks,

Drew

Drew Blair, P.Eng., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867

From: Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
Sent: Tuesday, May 11, 2021 2:09 PM
To: Drew Blair <D.Blair@novatech-eng.com>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: Pre-Consultation Follow-Up: 5331 Fernbank

Hi Drew,

Thanks for your email.

Could you please let me know where (on what page) you found the stormwater quantity control criteria (85 L/s/Ha) for this development in the 2019 JFSA report?

Thanks,

Santhosh

From: Drew Blair <D.Blair@novatech-eng.com>
Sent: May 10, 2021 3:11 PM
To: Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: FW: Pre-Consultation Follow-Up: 5331 Fernbank

We are currently working on our review of the stormwater design criteria from the 2019 J. F. Sabourin & Associates (JFSA) Monahan Drain Constructed Wetlands report that includes our site at 5331 Fernbank and have a question for you. The following statement "stormwater quantity control criteria – post development peak flow from the site shall be controlled to 70 L/s/ha" was provided in the pre-consultation notes below from the City for this site. From our review with JFSA and their 2019 report, our understanding from them is that the post development peak 100-Year minor system flow is 316 L/s for our site which divided by the site area of 3.7Ha is a minor system peak release rate of 85L/s/Ha. We will provide the background information and correspondence as part of our site plan submission.

Please confirm that we can proceed with the post development peak flow rate of 85L/s/Ha as per the 2019 JFSA report.

Please let us know if you need any further information.

Thanks,

Drew

Drew Blair, P.Eng., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867

From: Vincent Denomme <vincent.denomme@claridgehomes.com>
Sent: Thursday, February 18, 2021 9:14 AM
To: Shawn Malhotra <shawn.malhotra@claridgehomes.com>; Drew Blair <D.Blair@novatech-eng.com>; Marc St.Pierre <m.stpierre@novatech-eng.com>; Colleen McKeracher <cmckeracher@rlaarchitecture.ca>; Jim Burghout <jim.burghout@claridgehomes.com>; Brad Byvelds <B.Byvelds@novatech-eng.com>; Greg Winters <G.Winters@novatech-eng.com>
Subject: Fwd: Pre-Consultation Follow-Up: 5331 Fernbank

All,

See pre-consult comments for your review.

---------- Forwarded message ---------
From: **McCreight, Laurel** <Laurel.McCreight@ottawa.ca>
Date: Wed, Feb 17, 2021 at 8:05 AM
Subject: Pre-Consultation Follow-Up: 5331 Fernbank
To: Vincent Denomme <vincent.denomme@claridgehomes.com>

Hi Vincent,

Please refer to the below regarding the Pre-Application for 5331 Fernbank Road for a Site Plan Control Application for a residential development containing 16 walk-up apartment buildings. I have also attached the required Plans & Study List for application submission.

Below are staff's preliminary comments based on the information available at the time of the pre-consultation meeting:

Planning / Urban Design

- A public parkette should be provided as discussed in the pre-consult meeting.
    - Parks staff have indicated that a minimum size of 0.266 ha would be required based on the dedication requirements.
    - An illustration of a preferred location has been provided.

- The pathway block located on the east side of the subject site should be provided with a public outlet to Terry Fox Drive, and/or Cope Drive/Fernbank Road.
    - This could be achieved by way of a pathway block, or private pathways with a public pedestrian easement.
- Garbage buildings in various locations are preferable to the current proposed molok/earth bin proposal.
    - Please consult the waste management guidelines for planned unit developments.
- Variation of the building placement along the east edge of the site is encouraged.
    - Slightly off setting the blocks would create visual interest and allow for additional plantings abutting the north/south private drive aisle.
- Internal walkways should connect to existing and planned sidewalks within the right of way.
- Concrete sidewalks should be provided internal to the site.
- Parking areas should be consolidated to the greatest extent possible to allow for additional landscaping on site.
- The proposed amenity areas labelled as park should be designed to provide buffering from Terry Fox Drive for future users.
    - This is not an ideal location for a private amenity on-site, and if retained should be designed for passive use vs. active play etc.
- Please ensure that the final landscape design incorporates four season design – wind, shadow, conifers etc. and CPTED principles.
- There are areas that do not appear to provide the appropriate landscape buffers for parking areas.
- Consideration should be given to alternatives to the loop at the south end of the site (hammerhead etc.) to reduce the amount of hard surface required in that area.
- A design brief is required as part of the subject application.
    - A terms of reference is attached.
- You are encouraged to contact the Ward Councillor, Councillor Allan Hubley, about the proposal.

Parks

- Parkland dedication required rather than cash-in-lieu of parkland.
- Density and location of existing/proposed parks nearby are not close enough to serve these residents.
- Park size of approximately 0.266 ha requirement based on current unit types/property area - at the small end of our park sizes, but still appropriate for some play features for residents of this development.
- The area around Block A is best location due to frontage requirements and it is quieter than Terry Fox.
    - Full park requirements can be seen in the City's Park Development Manual.
- Pathway block at the end of Tabaret – important to provide connectivity to that existing path and new park (see comments above from Planning/Urban Design).
- What are intentions for narrow parcel – Part 1, Block 98?

    - We would like to see a pathway connection here with the park.
    - Consider dedicating a pathway block in the former ROW lands to provide the connectivity, especially if there are concerns regarding crossing privately-owned lands.

Please contact Infrastructure Parks Planner Reid Shepherd for follow-up questions.

Engineering

- Stormwater quantity control criteria – post development peak flow from the site shall be controlled to 70 L/s/ha.

- Existing sanitary sewer is available on Cope Drive to make service connection.
- Existing storm sewer is available on Cope Drive to make service connection.
- Existing watermain is available on Cope Drive to make service connection.
- If looping is required for water, a second service connection is required.
- Stormwater quality control – Consult with the Conservation Authority (RVCA) for their requirements.
    - Include the correspondence with RVCA in the stormwater/site servicing report.
- As per the City of Ottawa Slope Stability Guidelines for Development Applications an engineering report is required for any retaining walls proposed 1.0 m or greater in height within the subject site that addresses the global stability of the wall and provides structural details.
    - A Retaining Wall Stability Analysis Report and Retaining Wall Structural Details are required to be provided from a Professional Engineer licensed in the Province of Ontario that demonstrates the proposed retaining wall structure has been assessed for global instability as per City standards.
    - Please ensure the analysis and required documentation are provided as part of the submission to address this comment.
- Emergency routes will need to be satisfactory to Fire Services.
    - Please show fire routes on the site plan.
    - For information regarding fire route provisions, please consult with Kevin Heiss at kevin.heiss@ottawa.ca.

- Clearly show and label the property lines on all sides of the property.
- Clearly show and label all the easements (if any) on the property, on all plans.
- When calculating the post development composite runoff coefficient (C), please provide a drawing showing the individual drainage area and its runoff coefficient.
- When using the modified rational method to calculate the storage requirements for the site, the underground storage should not be included in the overall available storage.
    - The modified rational method assumes that the restricted flow rate is constant throughout the storm which, in this case, underestimates the storage requirement prior to the 1:100-year head elevation being reached. Alternately, if you wish to include the underground storage, you may use an assumed average release rate equal to 50% of the peak allowable rate.
    - Otherwise, disregard the underground storage as available storage or provide modeling to support the design.
- Engineering plans are to be submitted on standard A1 size (594mm x 841mm) sheets.
- Phase 1 ESA and Phase 2 ESA must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

1. Provide the following information for water main boundary conditions:

    1. Location map with water service connection location(s).
    2. Average daily demand (l/s).
    3. Maximum daily demand (l/s).
    4. Maximum hourly demand (l/s).
    5. Fire flow demand (provide detailed fire flow calculations based on Fire Underwriters survey (FUS) Water Supply for Public Fire Protection). Exposure separation distances shall be defined on a figure to support the FUS calculation and required fire flow (RFF).
    6. Hydrant capacity shall be assessed to demonstrate the RFF can be achieved. Please identify which hydrants are being considered to meet the RFF on a fire hydrant coverage plan as part of the boundary conditions request.

- If you are proposing any exterior light fixtures, all must be included and approved as part of the site plan approval. Therefore, the lights must be clearly identified by make, model and part number. All external light

fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the applicant must provide certification from an acceptable professional engineer. The location of all exterior fixtures, a table showing the fixture types (including make, model, part number), and the mounting heights must be included on a plan.

References and Resources

- As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.
- All required plans are to be submitted on standard A1 size sheets (594mm x 841mm) sheets, utilizing a reasonable and appropriate metric scale as per City of Ottawa Servicing and Grading Plan Requirements: title blocks are to be placed on the right of the sheets and not along the bottom. Engineering plans may be combined, but the Site Plans must be provided separately. Plans shall include the survey monument used to confirm datum. Information shall be provided to enable a non-surveyor to locate the survey monument presented by the consultant.
- All required plans & reports are to be provided in *.pdf format (at application submission and for any, and all, re-submissions)
- Please find relevant City of Ottawa Links to Preparing Studies and Plans below:
- https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#standards-policies-and-guidelines
- To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre:

  InformationCentre@ottawa.ca<mailto:InformationCentre@ottawa.ca>

  (613) 580-2424 ext. 44455

Please contact Infrastructure Project Manager Santhosh Kuruvilla for follow-up questions.

Transportation

- Follow Traffic Impact Assessment Guidelines
  - A TIA is required. Submit Scoping report at your earliest convenience.
  - Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
  - Although a full review of the TIA Strategy report (Step 4) is not required prior to an application, it is strongly recommended.
  - Synchro files are required at Step 4.
  - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
- ROW protection on Terry Fox and Cope is 44.5 and 24 metres, respectively.
- A sidewalk on Terry Fox is strongly recommended.
- No full movement access will be permitted on this segment of Terry Fox.
- A Road Noise Impact Study is required.

- For the two private accesses, provide enough throat length for arterial/collector as per TAC guidelines.
- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
    - Turning movement diagrams required for internal movements (loading areas, garbage).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Sidewalk is to be continuous across access as per City Specification 7.1.
    - Grey out any area that will not be impacted by this application.
- The City recommends development on private property be in accordance with the Accessibility Design Standards (AODA legislation). As the site proposed is residential, it is suggested that the design conforms to the Site Plan Checklist, which summarizes AODA requirements (attached).

Please contact Transportation Project Manager, Mike Giampa for follow-up questions.

Other

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please do not hesitate to contact me if you have any questions.

Regards,

Laurel

Laurel McCreight MCIP, RPP

Planner

Development Review West

Urbaniste

Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa

613.580.2424 ext./poste 16587

ottawa.ca/planning / ottawa.ca/urbanisme

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Vincent Dénommé
613-233-6030 ex 247

www.claridgehomes.com

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Appendix F

GENERAL

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL, AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN AND PAY ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. ALL DIMENSIONS AND INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION. IF THERE IS ANY DISCREPANCY THE CONTRACTOR IS TO NOTIFY THE ENGINEER PROMPTLY.
5. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. GAS, HYDRO, TELEPHONE OR ANY OTHER UTILITY THAT MAY EXIST ON SITE OR WITHIN THE STREETLINES MUST BE LOCATED BY ITS OWN UTILITIES AND VERIFIED PRIOR TO CONSTRUCTION.
6. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
7. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
8. ALL UNDERGROUND SERVICES MATERIALS AND INSTALLATIONS TO BE IN ACCORDANCE WITH THE CURRENT STANDARDS AND CODES OF THE MUNICIPALITY.
9. ALL SURFACE DRAINAGE SHALL BE SELF-CONTAINED, COLLECTED AND DISCHARGED AT A LOCATION TO BE APPROVED PRIOR TO THE ISSUANCE OF A BUILDING PERMIT.
10. WHEREVER PIPES ARE PASSING THROUGH UNCOMPACTED FILL AREA, THE BEDDING TRENCH SHALL BE EXCAVATED TO THE UNDISTURBED GROUND LEVEL AND BACKFILLED WITH GRANULAR "A" COMPACTED TO 100% STANDARD PROCTOR DENSITY.
11. BEFORE COMMENCING CONSTRUCTION PROVIDE PROOF OF COMPREHENSIVE ALL RISK AND OPERATIONAL LIABILITY INSURANCE INCLUDING BLASTING (ONLY IF REQUIRED). INSURANCE POLICY TO NAME THE OWNER, ENGINEER AND ARCHITECT AS CO-INSURED. AMOUNT OF INSURANCE TO BE SPECIFIED BY OWNERS AGENT.
12. CONNECTION TO EXISTING SYSTEMS AS DETAILED, INCLUDING ALL RESTORATION WORK NECESSARY TO REINSTATE SURFACES TO THE CONDITION THAT EXISTED PRIOR TO CONSTRUCTION OR BETTER.
13. STANDARD ROAD CUT SHALL BE IN ACCORDANCE WITH CITY STANDARD R10.
14. ASPHALT REINSTATEMENT SHALL BE IN ACCORDANCE WITH CITY STANDARD R25.
15. CONCRETE SIDEWALK TO BE CONSTRUCTED AS PER CITY STANDARDS SC-3, SC-5, SC-7, AND SC-8
16. CONTRACTOR TO PROVIDE LINE/PARKING PAINT LINES
17. BOULEVARDS SHALL BE REINSTATED WITH 150mm OF TOPSOIL AND SODDED.
18. INVESTIGATION REPORT FOR SUBSURFACE INFORMATION PREPARED BY THE GEOTECHNICAL CONSULTANT. INTERPRETATION OF INFORMATION IS THE RESPONSIBILITY OF THE CONTRACTOR.
19. REMOVE TOPSOIL AND STOCKPILE ONSITE IN A SUITABLE LOCATION.
20. TOPSOIL IN FILL AREA TO BE STRIPPED AND CLEAN FILL TO BE PLACED AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
21. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
22. THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY DATA SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION PURPOSES ONLY, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THESE PLANS.
23. THICKNESS OF GRANULAR MATERIAL AND ASPHALT LAYERS SHALL BE IN ACCORDANCE WITH CITY STANDARD ROAD CROSS SECTION AND AS PER THE GEOTECHNICAL CONSULTANTS RECOMMENDATIONS.
24. ALL ELEVATIONS ARE GEODETIC AND UTILITIZE METRIC UNITS. ALL MEASUREMENTS UTILIZE METRIC UNITS.
25. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INDICATE:PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANTS LOCATIONS, T/WM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC.
26. REFER TO ARCHITECTS AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS

SEWERS

1. ALL SEWER MATERIALS AND CONSTRUCTION METHODS MUST FOLLOW CITY OF OTTAWA STANDARDS.
2. ALL CATCHBASIN MANHOLES AND MANHOLES SHALL BE PRECAST AND CONFORM TO CITY OF OTTAWA DETAILS S24, S24.1, S25, S28, S28.1 AND OPSD 701.010.
3. ALL CATCHBASINS SHALL BE PRECAST AND CONFORM TO OPSD 705.010.
4. ALL CATCHBASIN MANHOLES AND CATCHBASINS TO HAVE A MINIMUM 0.6m SUMP AS PER OPSD UNLESS NOTED OTHERWISE.
5. REARYARD CATCHBASINS SHALL BE IN ACCORDANCE WITH CITY STANDARD DETAIL S29,S30 AND S31.
6. ALL CATCHBASINS SHALL INCLUDE 6.0m OF 150mmØ PERFORATED SUBDRAIN C/W FILTER CLOTH.
7. ROAD CATCHBASINS WITH SOLID COVER TO BE AS PER S19 SOLID COVER ALTERNATIVE.
8. ALL CATCHBASIN LEADS TO BE 200MM DIAMETER AND ALL REAR YARD CATCHBASIN LEADS TO BE 250MM DIAMETER, UNLESS OTHERWISE NOTED.
9. STORM SEWER SHALL BE CONCRETE CL III WITH TYPE "B" BEDDING OR PVC PIPE SDR 35 THROUGHOUT EXCEPT AT RISERS, UNLESS OTHERWISE NOTED, AS PER OPSD.
10. ALL PROPOSED FOUNDATION DRAINS SHALL BE CONNECTED TO STORM SEWER.
11. MANHOLE BENCHING SHALL FOLLOW MUNICIPALITY STANDARD DETAIL FOR MANHOLES WITH CONNECTING PIPES 900mm OR LARGER.
12. SEWER TRENCHING AND BEDDING SHALL BE AS PER CLASS "B" BEDDING CITY OF OTTAWA STANDARD DRAWING S-7, UNLESS NOTED OTHERWISE. BEDDING SHALL BE COMPACTED TO MINIMUM 98% STANDARD PROCTOR DRY DENSITY. CLEAR STONE BEDDING SHALL NOT BE PERMITTED.
13. SANITARY SEWERS AND CONNECTIONS 150mmØ AND SMALLER TO BE PVC SDR 28.
14. SANITARY SEWERS AND CONNECTIONS 200mmØ AND LARGER TO BE PVC SDR 35 WITH TYPE "B" BEDDING THROUGHOUT EXCEPT AT RISERS, UNLESS OTHERWISE NOTED.
15. ALL STORM AND SANITARY SERVICES ARE TO BE THE SIZES INDICATED AND THE MATERIAL SHALL BE PVC DR-28 @ 1.0% MINIMUM SLOPE.
16. INSULATE ALL STORM AND SANITARY SEWERS THAT HAVE LESS THAN 2.0m AND 2.5m OF EFFECTIVE COVER RESPECTIVELY WITH THERMAL INSULATION. PROVIDE 150mm OF CLEARANCE BETWEEN PIPE AND INSULATION.
17. SANITARY AND STORM SERVICES ARE TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, AT A MINIMUM SLOPE OF 1.0% UNLESS OTHERWISE INDICATED.
18. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS, LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS
19. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mm OR GREATER PRIOR TO BASE COURSE ASPHALT.UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH, CLEAN AND RE-TELEVISE ALL SEWERS & APPURTENANCES.
20. FULL PORT BACKWATER VALVES ARE REQUIRED ON THE SANITARY SERIES INSTALLED AS PER THE MANUFACTURERS BUILDING; INSTALLED AS PER ST. DWG S14.
21. WATERTIGHT COVERS TO BE LOCATED WITHIN STORMWATER MANAGEMENT PONDING AREAS AS PER OPSD 401.030. REFER TO SANITARY AND STORM WATERTIGHT LID TABLES.

WATERMAINS

1. CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. WATERMAIN TO BE PVC DR 18. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY CONTRACTOR. CONNECTION TO EXISTING WATERMAIN BY CITY OF OTTAWA. NO WORK TO COMMENCE UNLESS A CITY WATER WORKS INSPECTOR IS ON SITE.
2. WATERMAIN MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.25m OVER AND 0.50m UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
3. WATERMAINS ARE TO HAVE A MINIMUM COVER OF 2.4m WITH A MINIMUM HORIZONTAL SPACING OF 2.0m FROM THEMSELVES AND OTHER UTILITIES, AS PER CITY OF OTTAWA STANDARD DETAIL R-20.
4. PROVIDE THERMAL INSULATION FOR WATERMAIN AT OPEN STRUCTURES PER CITY OF OTTAWA STANDARD DETAIL W-23.
5. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
6. ALL CURB STOPS TO BE INSTALLED ON THE PROPERTY LINE UNLESS OTHERWISE NOTED.
7. WATERMAIN TRENCHING AND BEDDING TO CONFORM TO CITY OF OTTAWA STANDARD DETAIL W-17.
8. VALVES AND VALVE BOXES TO CONFORM WITH CITY OF OTTAWA STANDARD DETAIL W-24.
9. FIRE HYDRANT C/W VALVE AND BOX SHALL CONFORM TO CITY OF OTTAWA STANDARD DETAIL W-19.
10. CONCRETE THRUST BLOCKS ARE TO BE CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS W25.3 AND W25.4.
11. ALL WATERMAIN SERVICE INSTALLATIONS AT SEWER CROSSINGS PER CITY OF OTTAWA STANDARD DETAIL W-38.
12. WATER METER SHALL CONFORM TO CITY OF OTTAWA STANDARD DETAIL W-32. INSTALLATION BY CITY OF OTTAWA.
13. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0M OF FOUNDATION WALL AND LEAVE 6.0M OF COIL UNLESS OTHERWISE INDICATED
14. PRESSURE REDUCING VALVES (PRV) ARE TO BE INSTALLED ON EVERY WATER SERVICE.

TYPICAL SERVICING NOTES:

1. NO HORIZONTAL BENDS IN RIGHT-OF-WAY UNLESS OTHERWISE APPROVED BY THE CITY. MAXIMUM OF TWO 22.5° HORIZONTAL BENDS FOR SANITARY AND STORM SERVICES.
2. 1.0 % MINIMUM SANITARY AND STORM SERVICE GRADIENT WITH 2% PREFERRED.
3. STORM SERVICE LATERAL SHALL BE LOCATED TO THE LEFT OF SANITARY SERVICE LATERAL WHEN LOOKING AT THE STRUCTURE FROM THE STREET. SERVICE SIZES IN CONFORMANCE WITH S11.
4. SEE S7 FOR PIPE FOUNDATION, EMBEDMENT AND FINAL BACKFILL REQUIREMENTS.
5. MULTIPLE TAPS WITH SADDLES IN PVC WATERMAIN SHALL BE STAGGERED AND MINIMUM 600mm APART.
6. ELEVATION OF SERVICES VARIABLE DEPENDING ON GRADIENT AND/OR DEPTH OF COVER.
7. ALL DIMENSIONS ARE IN MILLIMETRES.
8. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELVEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.
9. GRADE AND/OR FILL BEHIND PROPOSED CURB AND BETWEEN BUILDINGS AND CURBS, WHERE REQUIRED TO PROVIDE POSITIVE DRAINAGE.
10. REFER TO ELECTRICAL DESIGN FOR UTILITY LOCATIONS.
11. SEE W27 FOR ADDITIONAL WATER SERVICING SCENARIOS.

GRADING

1. CONTACT CITY FOR ROUGH GRADING INSPECTION PRIOR TO PLACEMENT OF TOPSOIL OR TOPSOIL AND SOD.
2. FINISHED GRADING WILL NOT ADVERSELY AFFECT DRAINAGE PATTERNS OF ADJACENT LANDS.
3. MAXIMUM (3:1) SLOPES AT PROPERTY LINE AND WITHIN THE SITE UNLESS OTHERWISE INDICATED.
4. MATCH EXISTING ELEVATIONS AT ALL PROPERTY LINES. ENSURE POSITIVE DRAINAGE WHETHER INDICATED OR NOT.
5. WHERE EXISTING GRADE IS FOUND TO BE MORE THAN 300mm BELOW THE PROPOSED GRADES INDICATED ON THIS GRADING PLAN, CONTACT ENGINEER IMMEDIATELY.
6. SWALES LESS THAN 1.5% SHALL HAVE A 250mm SUBDRAIN AS PER CITY OF OTTAWA STANDARD S29, S30 AND S31.
7. MINIMUM OF 2% AND MAXIMUM OF 6% GRADE FOR GRASSED AREAS UNLESS OTHERWISE NOTED. SIDEWALK CROSSFALL NOT TO EXCEED 2%.
8. CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED
10. ALL PROPOSED STEPS IN WALKWAYS ARE TO BE WITHIN THE PROPERTY BOUNDARY.
11. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DEISGNED, REVIEWED, INSPECTED AND APPROVED BY THE GEOTECHNICAL ENGINEER.
12. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS

UTILITY NOTES:

1. CONTRACTOR TO CONTACT RESPECTIVE UTILITY COMPANIES TO DETERMINE EXACT LOCATION OF EXISTING UTILITIES BEFORE COMMENCING WORK. CONTRACTOR TO ASSUME ALL LIABILITY FOR DAMAGE TO EXISTING UTILITIES.
2. EXTEND ENCASED DUCT CROSSINGS 1.0m FROM BACK OF CURB OR SIDEWALK ON EACH SIDE.
3. CONTRACTOR SHALL EXCAVATE, BACKFILL, AND RESTORE ALL SURFACES TO EXISTING CONDITIONS FOR HYDRO PRIMARY, BELL, AND CABLEVISION CABLES.
4. CONTRACTOR SHALL SUPPLY AND INSTALL ALL DUCT WORK AND TRANSFORMER PAD. SINGLE PHASE TRANSFORMER PAD PER HYDRO OTTAWA DETAIL UCS0003.
5. TEMPORARILY COIL ALL SERVICE WIRES ON A 76mm X 76mm X 2.4m WOODEN POST FOR EACH UNIT WITH ENOUGH CONDUCTOR TO ALLOW FOR COMPLETION OF TRENCHING AND BUILDING CONNECTION.
6. MINIMUM 1.5m CLEARANCE TO BE PROVIDED FROM WATER SERVICES TO ALL PEDESTALS, TRANSFORMER PADS, ROAD DUCT CROSSINGS, AND STREET LIGHTS.
7. MINIMUM 3.0m CLEARANCE TO BE PROVIDED FROM HYDRANT TO ALL ABOVE GROUND STRUCTURES INCLUDING STREETLIGHTS, BELL PEDESTALS, CABLE PEDESTALS, TRANSFORMERS, SECTIONALIZERS, ETC.

PAVEMENT STRUCTURE NOTES

1. SUBGRADE MATERIAL SHALL BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY
2. ROADWAY GRANULAR MATERIAL SHALL BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY
3. ASPHALTIC CONCRETE TO BE COMPACTED TO AT LEAST 97% OF MARSHALL DENSITY
4. ROADWAY SUBGRADE TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER AT THE TIME OF CONSTRUCTION TO REVIEW THE GRANULAR 'B' DEPTH AND FOR THE NECESSITY OF A WOVEN GEOTEXTILE BELOW THE GRANULAR MATERIALS.
5. PRIOR TO THE PLACEMENT OF TOPLIFT, CONTRACTOR IS TO ADJUST ALL STRUCTURES AS PER CITY OF OTTAWA STANDARD R-2.

EROSION AND SEDIMENT CONTROL NOTES:

1. THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS AND DURING ALL PHASES OF THE SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCK AS BUT NOT LIMITED TO INSTALLING CATCHBASIN INSERTS ACROSS MH & CBS AND INSTALLING AND MAINTAINING LIGHT DUTY SILT FENCE BARRIERS AND STRAW BALE/ROCK CHECK DAMS AS REQUIRED.
2. CONDITIONS OF THE SILT FENCE AND STRAW BALE/ROCK CHECK DAMS TO BE INSPECTED REGULARLY AND REPLACED OR REPAIRED AS INSTRUCTED BY THE ENGINEER.
3. THE CONTRACTOR SHALL ENSURE THAT ROADS ARE KEPT CLEAN AT ALL TIMES USING SUCH PRACTICES AS WASHING DOWN TRUCK TIRES, ROAD SWEEPING AND FLUSHING ETC.
4. THE CONTRACTOR ACKNOWLEDGES THAT SURFACE EROSION AND SEDIMENT RUNOFF RESULTING FROM HIS CONSTRUCTION OPERATIONS WILL HAVE A DETRIMENTAL IMPACT TO ANY DOWNSTREAM WATERCOURSE OR SEWER, AND THAT ALL CONSTRUCTION OPERATIONS THAT MAY IMPACT UPON WATER QUALITY SHALL BE CARRIED OUT IN A MANNER THAT STRICTLY MEETS THE REQUIREMENTS OF ALL APPLICABLE LEGISLATION AND REGULATIONS.
5. AS SUCH, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CARRYING OUT HIS OPERATIONS, AND SUPPLYING AND INSTALLING ANY APPROPRIATE CONTROL MEASURES, SO AS TO PREVENT SEDIMENT LADEN RUNOFF FROM ENTERING ANY SEWER OR WATERCOURSE WITHIN DOWNSTREAM OF THE WORKING AREA FOR THIS PROJECT THE SUGGESTED ON-SITE MEASURES SHALL INCLUDE BUT SHALL NOT BE LIMITED TO THE FOLLOWING METHODS:
   - -CATCH BASIN SILTSACKS
   - -MAINTENANCE HOLE AND REAR YARD CATCH BASIN FILTERS
   - -LIGHT DUTY SILT FENCE
   - -MUD MATS
   - -STRAW BALE CHECK DAMS

   SPECIFIC MEASURES SHALL BE INSTALLED AT THE SPECIFIED LOCATIONS AND IN ACCORDANCE WITH THE REQUIREMENTS OF OPSS 577 WHERE APPROPRIATE, OR IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. WHERE, IN THE OPINION OF THE CONTRACT ADMINISTRATOR OR ANY REGULATORY AGENCY, THE INSTALLED CONTROL MEASURES FAIL TO PERFORM ADEQUATELY, THE CONTRACTOR SHALL SUPPLY AND INSTALL ADDITIONAL OR ALTERNATIVE MEASURES AS DIRECTED BY THE CONTRACT ADMINISTRATOR OR THE REGULATORY AGENCY. AS SUCH, THE CONTRACTOR SHALL HAVE ADDITIONAL CONTROL MATERIALS ON SITE AT ALL TIMES WHICH ARE EASILY ACCESSIBLE AND MAY BE IMPLEMENTED BY HIM AT A MOMENT'S NOTICE.
7. THE CONTRACTOR SHALL ENSURE THAT ALL WORKERS, INCLUDING IN THE WORKING AREA ARE AWARE OF THE IMPORTANCE OF THE EROSION AND SEDIMENT CONTROL MEASURES AND INFORMED OF THE CONSEQUENCES OF THE FAILURE TO COMPLY WITH THE REQUIREMENTS OF ALL REGULATORY AGENCIES AND THE SPECIFICATIONS DETAILED HEREIN.
8. THE CONTRACTOR SHALL PERIODICALLY, OR WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENT DEPOSITS AS REQUIRED AT THE SEDIMENT CONTROL DEVICES, INCLUDING THOSE DEPOSITS THAT MAY ORIGINATE FROM OUTSIDE THE CONSTRUCTION AREA. ACCUMULATED SEDIMENT SHALL BE REMOVED IN SUCH A MANNER THAT PREVENTS THE DEPOSITION OF THIS MATERIAL INTO ANY SEWER OR WATERCOURSE AND AVOIDS DAMAGE TO THE CONTROL MEASURE. THE SEDIMENT SHALL BE REMOVED FROM THE SITE AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH THE REQUIREMENTS FOR EXCESS EARTH MATERIAL, AS SPECIFIED ELSEWHERE IN THE CONTRACT.

PAVEMENT STRUCTURE:

REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS

Light Duty Parking
50mm HL3 OR SUPERPAVE 12.5
150mm GRAN 'A'
300mm GRAN 'B' TYPE II

Access Lanes and Heavy Duty Truck Parking
40mm SUPERPAVE 12.5 CLASS B
50mm SUPERPAVE 19.0 CLASS B
150mm GRAN 'A'
400mm GRAN 'B' TYPE II

* GRANULAR BASE TO BE COMPACTED TO 99% STANDARD PROCTOR DRY DENSITY.

SANITARY MANHOLES THAT REQUIRE WATERTIGHT LIDS AS PER CITY SPEC MS-22.15
MH ID
105
111
115
127
131
135
145
161
167

STORM MANHOLES THAT REQUIRE WATERTIGHT LIDS AS PER CITY SPEC MS-22.15
MH ID
212
224
230

LEGEND

- SITE BOUNDARY
- 97.75 — PROPOSED ELEVATION
- 98.00 — EXISTING ELEVATION
- 98.85TW — PROPOSED TOP OF WALL ELEVATION
- 97.75BW — PROPOSED BOTTOM OF WALL ELEVATION
- 96.00CLD — PROPOSED CENTERLINE OF DITCH ELEVATION
- 97.55(S) — PROPOSED SWALE ELEVATION
- 97.40 — PROPOSED TERRACE ELEVATION
- 1.3% — PROPOSED SLOPE
- PROPOSED CENTRELINE SWALE
- PROPOSED TERRACING (MAXIMUM 3:1 SLOPE)
- BARRIER CURB — PROPOSED BARRIER CURB AS PER SC1.1
- PROPOSED TWSI AS PER CITY OF OTTAWA DETAIL 7.2
- PROPOSED RETAINING WALL
- PROPOSED SIDEWALK
- 97.35 — STATIC PONDING AREA AND SPILL DEPTH ELEVATION
- 98.45 / 97.25 — 1:100yr PONDING AREA AND ELEVATION; 1:5yr PONDING AREA AND ELEVATION
- 98.00 / 97.50 / 97.00 — *EXISTING* CONTOUR LINE AND CONTOUR ELEVATION
- USF — PROPOSED UNDERSIDE OF FOOTING ELEVATION
- HYD. T/F — PROPOSED HYDRANT TOP OF FLANGE ELEVATION
- T/G — PROPOSED TOP OF GRATE ELEVATION
- PROPOSED MAJOR OVERLAND FLOW ROUTE
- AREA 1 / 815-813 / 0.81 / 89.1 — AREA ID; MANHOLE TO MANHOLE; POPULATION EQUIVALENT; AREA IN HECTARES
- SANITARY DRAINAGE AREA BOUNDARY
- 1.00 / 1 / 105-103 / 0.50 — DRAINAGE AREA (hectares); AREA IDENTIFICATION; MANHOLE TO MANHOLE; RUN-OFF COEFFICIENT
- DRAINAGE AREA BOUNDARY
- 101 — PROPOSED SANITARY MANHOLE
- 100 — PROPOSED STORM MANHOLE
- CBMH1 — PROPOSED CATCHBASIN/MANHOLE
- CB1 — PROPOSED CATCHBASIN
- CB 2 — PROPOSED CATCHBASIN & LEAD
- RYE 1 — PROPOSED REAR YARD ELBOW
- RYT 1 — PROPOSED REAR YARD TEE
- V&VB — PROPOSED VALVE & VALVE BOX LOCATION
- PROPOSED HYDRANT C/W VALVE & LEAD
- 200mmØ — PROPOSED WATERMAIN AND DIAMETER
- HYD — PROPOSED VALVE LOCATION
- V&VB — VALVE & VALVE BOX
- V&VC — VALVE & VALVE CHAMBER
- T/F=98.45 — PROPOSED TOP OF BOTTOM FLANGE
- BEND 11.25 — PROPOSED BEND AND THRUSTBLOCK 11.25°; 22.5°; 45° or TEE
- PRV — PRESSURE REDUCING VALVE
- PROPOSED DIRECTION OF FLOW

- CBMH 101 — PROPOSED CATCHBASIN MANHOLE INSERT
- PROPOSED CATCHBASIN INSERT
- PROPOSED SILT FENCE (SEE OPSD
- PROPOSED ROCK CHECK DAM (SEE OPSD 219.210)
- PROPOSED MUD MAT
- PROPOSED STRAW BALE (SEE OPSD 219.180)
- PROPOSED TWSI AS PER SC7.3
- CONCRETE
- ROAD CUT AS PER CITY OF OTTAWA DETAIL R10
- STM MH — *EXISTING STORM MANHOLE AND SEWER*
- SAN MH — *EXISTING SANITARY MANHOLE AND SEWER*
- V.V.B — *EXISTING VALVE AND VALE BOX*
- *EXISTING FIRE HYDRANT*
- EX.CB — *EXISTING CATCHBASIN*
- T/G — *EXISTING TOP OF GRATE*
- EX.UP — *EXISTING UTILITY POLE C/W GUY WIRES*
- LS — *EXISTING LIGHT STANDARD*
- *EXISTING ℄ DITCH*
- 7A — 450mmØ — *EXISTING SANITARY MANHOLE & SEWER*
- 300mmØ — *EXISTING WATERMAIN*
- HYD — *EXISTING FIRE HYDRANT C/W LEAD*
- V&VB — *EXISTING VALVE & VALVE BOX LOCATION*
- V&VC — *EXISTING VALVE & VALVE CHAMBER LOCATION*
- UP — *EXISTING UTILITY POLE*
- OHW — *EXISTING OVER HEAD WIRE*
- *EXISTING SIDEWALK*
- MH 101 — *EXISTING SANITARY MH & SEWER*
- MH 102 — *EXISTING STORM MH & SEWER*
- 200mmØ WM — *EXISTING WATERMAIN*

NOTE:
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PRELIMINARY
NOT FOR
CONSTRUCTION

No.	REVISION	DATE	BY
2.	REVISED PER CITY COMMENTS	NOV 5/21	DDB
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JUN 2/21	DDB

SCALE

DESIGN DDB
CHECKED DDB
DRAWN AE
CHECKED DDB
APPROVED DDB

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — D. D. BLAIR — 100122737 — NOV. 5 2021 — PROVINCE OF ONTARIO

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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

DRAWING NAME
NOTES, LEGENDS AND DETAILS

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-NLD

D07-12-21-0080
#18539

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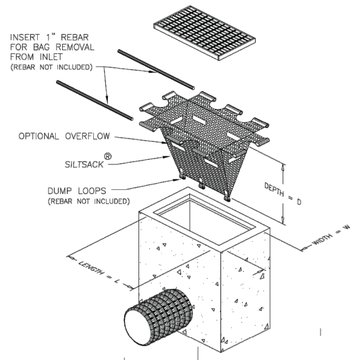
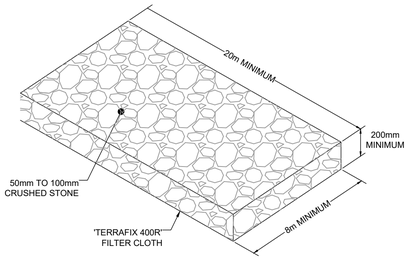
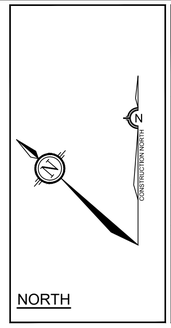
LEGEND

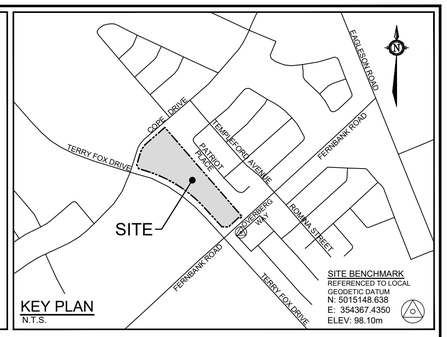
- SITE BOUNDARY
- MAXIMUM 3:1 SIDESLOPE
- PROPOSED CENTRELINE SWALE
- HYD — PROPOSED HYDRANT LOCATION
- 112 — PROPOSED SANITARY MANHOLE
- 820 — PROPOSED STORM MANHOLE
- CBMH 101 — PROPOSED CATCHBASIN MANHOLE INSERT
- PROPOSED CATCHBASIN INSERT
- PROPOSED SILT FENCE (SEE OPSD 219.110)
- PROPOSED MUD MAT
- PROPOSED STRAW BALE (SEE OPSD 219.180)

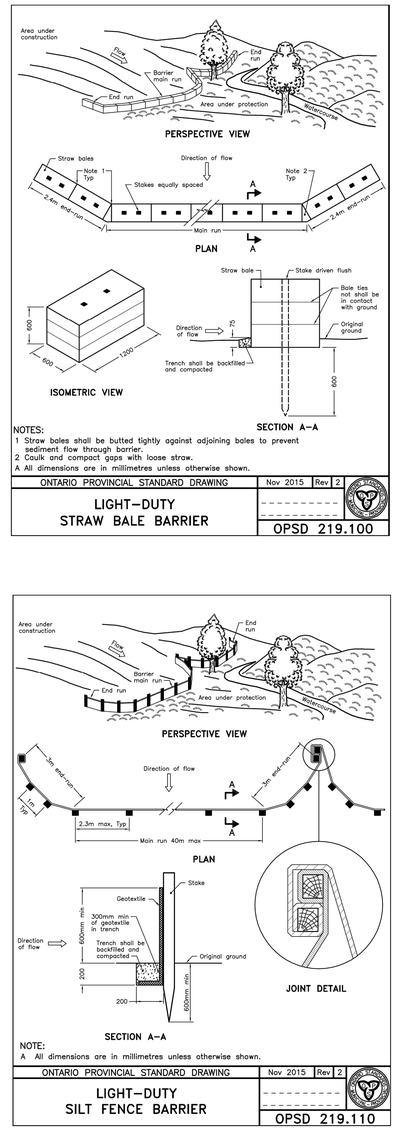




MUD MAT DETAIL
NTS







REFER TO 121011-NLD FOR ADDITIONAL NOTES

NOTE:
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2.	REVISED PER CITY COMMENTS	NOV 5/21	DDB
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JUN 2/21	DDB

SCALE
1:750
1:750
0 10 20 30

DESIGN DDB
CHECKED MSP
DRAWN AE
CHECKED DDB
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER D. D. BLAIR 100122737 NOV. 5 2021 PROVINCE OF ONTARIO

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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

DRAWING NAME
EROSION AND SEDIMENT CONTROL PLAN

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-ESC

D07-12-21-0080
#18539

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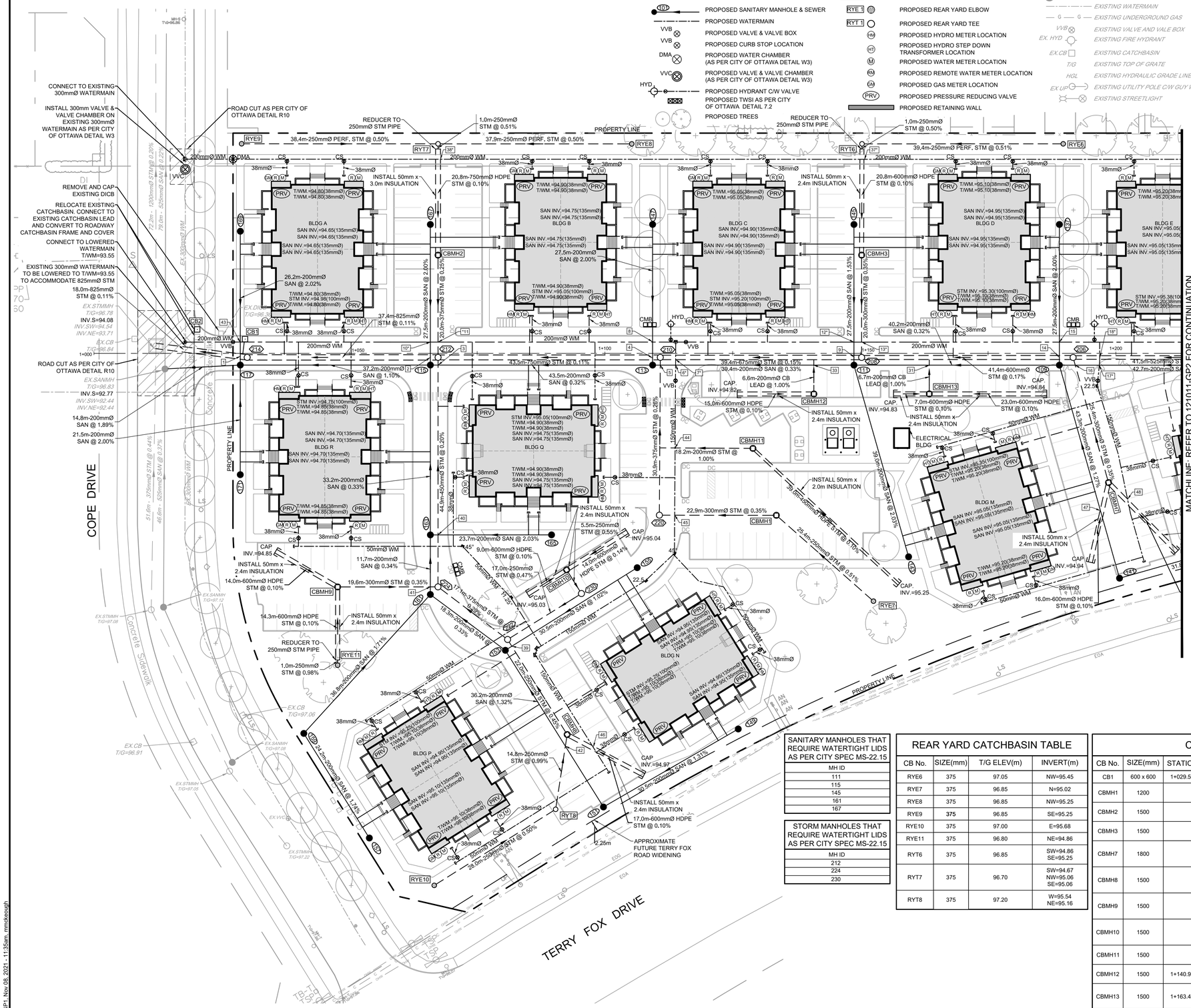
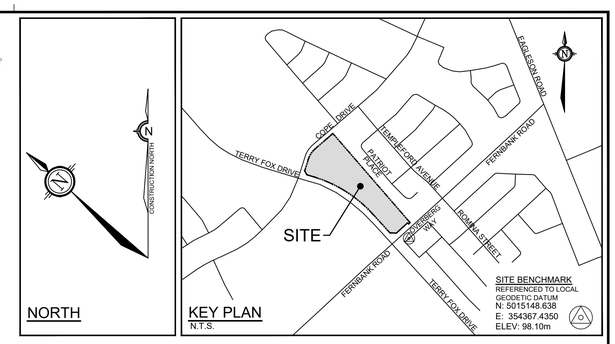
PLANAT.DWG - JM1mmc08dec

LEGEND

- SITE BOUNDARY
- PROPOSED STORM MANHOLE & SEWER (100)
- PROPOSED SANITARY MANHOLE & SEWER (100)
- PROPOSED WATERMAIN
- PROPOSED VALVE & VALVE BOX (VVB)
- PROPOSED CURB STOP LOCATION (VVB)
- PROPOSED WATER CHAMBER (AS PER CITY OF OTTAWA DETAIL W3) (DMA)
- PROPOSED VALVE & VALVE CHAMBER (AS PER CITY OF OTTAWA DETAIL W3) (VVC)
- PROPOSED HYDRANT C/W VALVE (HYD)
- PROPOSED TWSI AS PER CITY OF OTTAWA DETAIL 7.2
- PROPOSED TREES
- PROPOSED CATCHBASIN (CB 1)
- PROPOSED CATCHBASIN MANHOLE (CBMH 1)
- PROPOSED REAR YARD ELBOW (RYE 1)
- PROPOSED REAR YARD TEE (RYT 1)
- PROPOSED HYDRO METER LOCATION (HM)
- PROPOSED HYDRO STEP DOWN TRANSFORMER LOCATION (HT)
- PROPOSED WATER METER LOCATION (M)
- PROPOSED REMOTE WATER METER LOCATION (RM)
- PROPOSED GAS METER LOCATION (GM)
- PROPOSED PRESSURE REDUCING VALVE (PRV)
- PROPOSED RETAINING WALL
- EXISTING STORM MANHOLE AND SEWER (STM MH)
- EXISTING SANITARY MANHOLE AND SEWER (SAN MH)
- EXISTING WATERMAIN
- EXISTING UNDERGROUND GAS (G — G)
- EXISTING VALVE AND VALE BOX (VVB)
- EXISTING FIRE HYDRANT (EX. HYD)
- EXISTING CATCHBASIN (EX.CB)
- EXISTING TOP OF GRATE (T/G)
- EXISTING HYDRAULIC GRADE LINE (HGL)
- EXISTING UTILITY POLE C/W GUY WIRES (EX UP)
- EXISTING STREETLIGHT





PIPE CROSSING TABLE

CROSSING #	WATERMAIN	SANITARY	STORM
1		INV = 93.14 OBV = 93.34	INV = 94.10 OBV = 95.04
2		INV = 93.55 OBV = 93.75	INV = 94.13 OBV = 95.07
3		INV = 93.46 OBV = 93.66	INV = 94.52 OBV = 95.05
4		INV = 93.69 OBV = 93.89	INV = 94.26 OBV = 95.12
5		INV = 93.60 OBV = 93.80	INV = 94.63 OBV = 95.09
6*	INV = 92.96 OBV = 93.11	INV = 93.61 OBV = 93.81	
7*	INV = 92.96 OBV = 93.11		INV = 94.33 OBV = 95.11
8	INV = 94.50 OBV = 94.70	INV = 93.75 OBV = 93.95	
9		INV = 93.81 OBV = 94.01	INV = 94.39 OBV = 95.17
10*	INV = 92.76 OBV = 92.96	INV = 93.61 OBV = 93.81	
11*	INV = 92.76 OBV = 92.96		INV = 94.60 OBV = 95.06
12*	INV = 92.96 OBV = 93.16	INV = 93.86 OBV = 94.06	
13*	INV = 92.96 OBV = 93.16		INV = 94.77 OBV = 95.14
14		INV = 93.95 OBV = 94.15	INV = 94.53 OBV = 95.23
15	INV = 94.68 OBV = 94.88	INV = 94.01 OBV = 94.21	
16		INV = 93.87 OBV = 94.07	INV = 94.84 OBV = 95.21
17*	INV = 93.24 OBV = 93.39	INV = 93.89 OBV = 94.09	
18*	INV = 93.24 OBV = 93.39		INV = 94.61 OBV = 95.22
31		INV = 93.78 OBV = 93.98	INV = 94.76 OBV = 94.96
33		INV = 93.70 OBV = 93.90	INV = 94.75 OBV = 94.95
37*	INV = 94.15 OBV = 94.35		INV = 94.85 OBV = 95.45
38*	INV = 93.96 OBV = 94.16		INV = 94.66 OBV = 95.41
39		INV = 94.04 OBV = 94.24	INV = 94.86 OBV = 95.11
40		INV = 93.92 OBV = 94.12	INV = 94.59 OBV = 95.12
41		INV = 93.66 OBV = 93.86	INV = 94.77 OBV = 95.14
42		INV = 94.08 OBV = 94.28	INV = 95.03 OBV = 95.28
43	INV = 94.27 OBV = 94.47	INV = 93.20 OBV = 93.40	
44	INV = 94.40 OBV = 94.55		INV = 95.05 OBV = 95.25
45	INV = 94.14 OBV = 94.29		INV = 94.79 OBV = 95.09
46	INV = 94.31 OBV = 94.46		INV = 94.96 OBV = 95.62
47		INV = 94.31 OBV = 94.51	INV = 94.93 OBV = 95.53
48	INV = 94.28 OBV = 94.43		INV = 94.93 OBV = 95.53

* WATERMAIN CROSSING AS PER W25 & W25.2
PROVIDE THERMAL INSULATION AS PER W22

SAN MANHOLE TABLE

MANHOLE ID	SIZE(mm)	STATION	T/G ELEV(m)	INVERT(m)
109	1200	1+188.95	97.23	SE=93.86 NW=93.86 NE=93.92 SW=93.92
111	1200	1+148.74	96.99	SE=93.73 NW=93.73 SW=93.79 NE=93.79
113	1200	1+109.33	97.06	SE=93.60 NW=93.60 NE=93.66
115	1200	1+065.84	96.98	SE=93.46 NW=93.46 SW=93.52 NE=93.52
117	1200	1+028.64	96.90	SE=93.05 NW=93.05 NE=93.11 SW=93.60
137	1200		97.54	SW=94.47
141	1200		97.44	SE=94.53 NE=94.47
143	1200		97.45	NE=94.58
145	1200		96.95	SW=94.21
147	1200		97.28	SW=94.21
149	1200		97.57	W=94.73
151	1200		97.40	E=94.33 N=94.27
153	1200		97.12	S=93.79 E=93.82 N=93.76
155	1200		97.20	W=94.13
157	1200		97.62	N=94.81
159	1200		97.35	S=94.39 E=94.33
161	1200		96.96	W=93.70 NE=93.67 S=93.70
163	1200		97.02	SW=93.63 SE=93.69 NE=93.63
165	1200		97.30	NW=94.17
167	1200		96.78	SW=94.07
169	1200		97.09	SW=93.64
171	1200		97.17	NE=94.03

SANITARY MANHOLES THAT REQUIRE WATERTIGHT LIDS AS PER CITY SPEC MS-22.15

MH ID
111
115
145
161
167

STORM MANHOLES THAT REQUIRE WATERTIGHT LIDS AS PER CITY SPEC MS-22.15

MH ID
212
224
230

REAR YARD CATCHBASIN TABLE

CB No.	SIZE(mm)	T/G ELEV(m)	INVERT(m)
RYE6	375	97.05	NW=95.45
RYE7	375	96.85	N=95.02
RYE8	375	96.85	NW=95.25
RYE9	375	96.85	SE=95.25
RYE10	375	97.00	E=95.68
RYE11	375	96.80	NE=94.86
RYT6	375	96.85	SW=94.86 SE=95.25
RYT7	375	96.70	SW=94.67 NW=95.06 SE=95.06
RYT8	375	97.20	W=95.54 NE=95.16

CATCHBASIN TABLE

CB No.	SIZE(mm)	STATION	T/G ELEV(m)	INVERT(m)	ICD DIA.(mm)
CB1	600 x 600	1+029.57	96.88	SW=95.27	83mm PLATE
CBMH1	1200		96.85	S=94.89 NW=94.86	83mm PLATE
CBMH2	1500		96.70	SW=94.64 NE=94.64	105mm PLATE
CBMH3	1500		96.85	SW=94.83 NE=94.83	80mm PLATE
CBMH7	1800		96.95	NE=94.92 SW=94.92 S=94.92	114mm PLATE
CBMH8	1500		96.85	N=94.95 SW=95.01 S=94.95	TEMPEST LMF VORTEX 92
CBMH9	1500		96.80	SE=94.83 SW=94.83 N=94.83	83mm PLATE
CBMH10	1500		96.85	S=95.02 E=95.02 W=95.02	87mm PLATE
CBMH11	1500		96.80	NW=95.21 S=95.21	80mm PLATE
CBMH12	1500	1+140.90	96.83	NE=94.81 NW=94.81	TEMPEST LMF VORTEX 73
CBMH13	1500	1+163.49	96.83	NE=94.82 NW=94.82 SE=94.82	TEMPEST LMF VORTEX 75

STM MANHOLE TABLE

MANHOLE ID	SIZE(mm)	STATION	T/G ELEV(m)	INVERT(m)
206	1200	1+191.63	97.26	SE=94.60 SW=94.83 NW=94.53
208	1500	1+150.24	97.03	SE=94.46 NE=94.76 NW=94.39
210	1500	1+110.84	97.09	SE=94.33 SW=94.63 NW=94.26
212	1500	1+067.34	96.94	SE=94.21 SW=94.52 NE=94.59 NW=94.14
214	1500	1+029.99	96.91	NW=94.10 SE=94.10
220	1200		97.16	SE=94.78 NE=94.71
222	1200		97.12	N=94.73 S=94.85 E=94.85
224	1200		96.97	S=94.68 NE=94.61 NW=94.76
230	1200		97.03	N=94.99 W=94.93

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

PRELIMINARY
NOT FOR
CONSTRUCTION

No.	REVISION	DATE	BY
2.	REVISED PER CITY COMMENTS	NOV 5/21	DDB
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JUN 2/21	DDB

SCALE: 1:400
1:400
0 4 8 12 16

DESIGN: DDB
CHECKED: MSP
DRAWN: MTM
CHECKED: DDB
APPROVED: MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
NOV. 5 2021
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Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

DRAWING NAME: GENERAL PLAN OF SERVICES

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-GP1

D07-12-21-0080
#18539

M:\2021\121011\CAD\Design\121011-GP.dwg, GP1, Nov 08, 2021 - 11:35am, mmckeough
PLANA1 DWG - Bill Irvine/Sheet

LEGEND

- SITE BOUNDARY
- PROPOSED STORM MANHOLE & SEWER
- PROPOSED SANITARY MANHOLE & SEWER
- PROPOSED WATERMAIN
- PROPOSED VALVE & VALVE BOX
- PROPOSED CURB STOP LOCATION
- PROPOSED WATER CHAMBER (AS PER CITY OF OTTAWA DETAIL W3)
- PROPOSED VALVE & VALVE CHAMBER (AS PER CITY OF OTTAWA DETAIL W3)
- PROPOSED HYDRANT C/W VALVE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED REAR YARD ELBOW
- PROPOSED REAR YARD TEE
- PROPOSED TWSI AS PER CITY OF OTTAWA DETAIL 7.2
- PROPOSED TREES
- PROPOSED HYDRO METER LOCATION
- PROPOSED HYDRO STEP DOWN TRANSFORMER LOCATION
- PROPOSED WATER METER LOCATION
- PROPOSED REMOTE WATER METER LOCATION
- PROPOSED GAS METER LOCATION
- PROPOSED PRESSURE REDUCING VALVE
- PROPOSED RETAINING WALL
- EXISTING STORM MANHOLE AND SEWER
- EXISTING SANITARY MANHOLE AND SEWER
- EXISTING WATERMAIN
- EXISTING UNDERGROUND GAS
- EXISTING VALVE AND VALE BOX
- EXISTING FIRE HYDRANT
- EXISTING CATCHBASIN
- EXISTING TOP OF GRATE
- EXISTING HYDRAULIC GRADE LINE
- EXISTING UTILITY POLE C/W GUY WIRES
- EXISTING STREETLIGHT

NORTH

CONSTRUCTION NORTH

KEY PLAN
N.T.S.

SITE

EAGLESON ROAD
COPE DRIVE
TEMPLEMORE AVENUE
PATRIOT RIDGE
FERNBANK ROAD
TERRY FOX DRIVE
ROSEBERRY PLACE
ROSEMARY STREET

SITE BENCHMARK
REFERENCED TO LOCAL GEODETIC DATUM
N: 5015148.638
E: 354367.4350
ELEV: 98.10m

MATCHLINE: REFER TO 121011-GP1 FOR CONTINUATION

TERRY FOX DRIVE

FERNBANK ROAD

PROPERTY LINE

RETAINING WALL

INSTALL 50mm x 2.4m INSULATION

CAP INV.=95.24

10.0m-600mmØ HDPE STM @ 0.10%

22.1m-600mmØ HDPE STM @ 0.10%

REDUCER TO 250mmØ STM PIPE

17.0m-250mmØ PERF. STM @ 0.51%

PROPOSED 2:1 SLOPED GRATE
TOP T/G=96.95
BOTTOM T/G=96.20

EX.DICB T/G=96.20

PROPOSED CONCRETE BUS PAD AS PER CITY OF OTTAWA STANDARD DETAIL SC11

EX.CB T/G=97.21

EX.CB T/G=96.36

EX.STMMH T/G=97.41

EX.STMMH T/G=97.55

EX.STMMH T/G=97.67

BLDG E
SAN INV.=95.05(135mmØ)
SAN INV.=95.05(135mmØ)
SAN INV.=95.05(135mmØ)

BLDG F
SAN INV.=95.20(135mmØ)
SAN INV.=95.20(135mmØ)
SAN INV.=95.20(135mmØ)

BLDG G
SAN INV.=95.30(135mmØ)
SAN INV.=95.30(135mmØ)
SAN INV.=95.30(135mmØ)

BLDG H
SAN INV.=95.35(135mmØ)
SAN INV.=95.35(135mmØ)
SAN INV.=95.35(135mmØ)

BLDG J
SAN INV.=95.45(135mmØ)
SAN INV.=95.45(135mmØ)
SAN INV.=95.45(135mmØ)

BLDG K
SAN INV.=95.45(135mmØ)
SAN INV.=95.45(135mmØ)
SAN INV.=95.45(135mmØ)

BLDG L
SAN INV.=95.25(135mmØ)
SAN INV.=95.25(135mmØ)
SAN INV.=95.15(135mmØ)

43.3m-250mmØ PERF. STM @ 0.51%
38.6m-250mmØ PERF. STM @ 0.52%
21.8m-250mmØ STM @ 0.50%
41.5m-525mmØ STM @ 0.22%
42.7m-200mmØ SAN @ 0.33%
81.9m-450mmØ STM @ 0.21%
44.2m-200mmØ SAN @ 0.34%
43.3m-200mmØ SAN @ 1.27%
31.8m-200mmØ SAN @ 1.29%
48.0m-375mmØ STM @ 0.25%
51.0m-200mmØ SAN @ 0.33%
37.7m-200mmØ SAN @ 0.35%
43.6m-250mmØ STM @ 0.50%
32.5m-250mmØ STM @ 0.52%
28m-600mmØ CSP CULVERT @ 0.5%
INV.NW=96.67 OBV.=97.27
INV.SE=96.53 OBV=97.13
16.5m-250mmØ STM @ 0.50%
INV=95.96
2.25m
21.1m-200mmØ SAN @ 1.94%
20.5m-200mmØ SAN @ 0.68%
17.6m-300mmØ STM @ 0.40%
7.1m-375mmØ STM @ 0.28%
7.1m-200mmØ SAN @ 0.42%
39.6m-250mmØ STM @ 0.45%
39.6m-200mmØ SAN @ 0.33%
12.1m-250mmØ PERF. STM @ 0.50%
18.1m-200mmØ SAN @ 0.66%
11.0m-200mmØ SAN @ 2.00%
7.1m-200mmØ CB LEAD @ 1.00%
6.9m-600mmØ HDPE STM @ 0.10%
15.9m-600mmØ HDPE STM @ 0.10%
11.6m-250mmØ PERF. STM @ 0.50%
16.0m-600mmØ HDPE STM @ 0.10%
19.0m-600mmØ HDPE STM @ 0.10%
16.5m-600mmØ HDPE STM @ 0.10%

APPROXIMATE FUTURE TERRY FOX ROAD WIDENING

HYDRO OTTAWA TO REPLACE EXISTING POLE AND INSTALL TALLER POLE TO PROVIDE ADEQUATE CLEARANCE FROM OVERHEAD WIRES TO PROPOSED ENTRANCE

EXISTING LIGHT TO BE RE-LOCATED BEHIND SIDEWALK

HYDRO OTTAWA TO REPLACE EXISTING POLE AND INSTALL TALLER POLE TO PROVIDE ADEQUATE CLEARANCE FROM OVERHEAD WIRES TO PROPOSED ENTRANCE

SAN MANHOLE TABLE

MANHOLE ID	SIZE(mm)	STATION	T/G ELEV(m)	INVERT(m)
101	1200	1+364.55	97.63	NW=94.45 SW=94.85 NE=94.51
103	1200	1+313.56	97.56	SE=94.28 NW=94.28 NE=94.34
105	1200	1+275.85	97.41	SE=94.15 NW=94.15 NE=94.21
107	1200	1+231.65	97.41	SE=94.00 NW=94.00 NE=94.06
109	1200	1+188.95	97.23	SE=93.86 NW=93.86 NE=93.92 SW=93.92
119	1200		97.90	SW=95.20
121	1200		97.50	NE=94.79 SW=94.79 NW=94.73
123	1200		97.40	NE=94.91
125	1200		97.56	SE=94.60 NE=94.54 SW=94.54
127	1200		97.42	SW=94.68
129	1200		97.75	NE=95.07
131	1200		97.39	SW=94.62
133	1200		97.59	SW=94.76
135	1200		97.23	SW=94.48
137	1200		97.54	SW=94.47
139	1200		97.75	NW=94.94
141	1200		97.44	SE=94.53 NE=94.47

STM MANHOLE TABLE

MANHOLE ID	SIZE(mm)	STATION	T/G ELEV(m)	INVERT(m)
200	1200	1+363.05	97.60	NW=95.12 NE=95.18
202	1200	1+315.06	97.57	SE=95.00 NE=95.13 NW=94.93
204	1200	1+233.15	97.42	SE=94.76 NE=94.91 NW=94.69
206	1200	1+191.63	97.26	SE=94.60 SW=94.83 NW=94.53
218	1200	1+363.05	97.54	SE=95.32 NE=95.27 SW=95.20

PIPE CROSSING TABLE

CROSSING #	WATERMAIN	SANITARY	STORM
19		INV = 94.08 OBV = 94.28	INV = 94.69 OBV = 95.30
20*	INV = 93.36 OBV = 93.56		INV = 94.92 OBV = 95.29
21*	INV = 93.36 OBV = 93.56	INV = 94.13 OBV = 94.33	
22	INV = 95.00 OBV = 95.05	INV = 94.02 OBV = 94.22	
23*	INV = 94.22 OBV = 94.27		INV = 94.77 OBV = 95.30
24		INV = 94.24 OBV = 94.44	INV = 94.85 OBV = 95.38
25	INV = 94.95 OBV = 95.15	INV = 94.30 OBV = 94.50	
26		INV = 94.16 OBV = 94.36	INV = 95.12 OBV = 95.32
27*	INV = 93.64 OBV = 93.84	INV = 94.39 OBV = 94.59	
28*	INV = 93.64 OBV = 93.84		INV = 95.14 OBV = 95.39
29		INV = 94.36 OBV = 94.56	INV = 94.93 OBV = 95.38
30		INV = 94.33 OBV = 94.53	INV = 95.54 OBV = 95.74
32		INV = 94.55 OBV = 94.75	INV = 95.33 OBV = 95.53
34		INV = 94.73 OBV = 94.93	INV = 95.57 OBV = 95.82
35*	INV = 94.80 OBV = 94.85		INV = 95.35 OBV = 95.95
36*	INV = 94.43 OBV = 94.63		INV = 95.13 OBV = 95.38
47		INV = 94.31 OBV = 94.51	INV = 94.93 OBV = 95.53
48	INV = 94.28 OBV = 94.43		INV = 94.93 OBV = 95.53

* WATERMAIN CROSSING AS PER W25 & W25.2
PROVIDE THERMAL INSULATION AS PER W22
WHERE THERE IS LESS THAN 2.4m COVER.

CATCHBASIN TABLE

CB No.	SIZE(mm)	STATION	T/G ELEV(m)	INVERT(m)	ICD DIA.(mm)
CBMH4	1200		97.15	SW=94.98 NE=95.03	TEMPEST LMF VORTEX 101
CBMH5	1500		97.30	SW=95.23 NE=95.23	80mm PLATE
CBMH6	1500		97.35	SW=95.34 NE=95.34	108mm PLATE
CBMH7	1800		96.95	NE=94.92 SW=94.92 S=94.92	114mm PLATE
CBMH14	1500	1+279.26	97.25	NE=95.18 W=95.21	TEMPEST LMF VORTEX 70
CBMH15	1200	1+327.36	97.30	NE=95.60	73mm PLATE
CBMH16	1200		97.45	NW=95.50 SW=95.56	104mm PLATE

SANITARY MANHOLES THAT REQUIRE WATERTIGHT LIDS AS PER CITY SPEC MS-22.15

MH ID
105
127
131
135

REAR YARD CATCHBASIN TABLE

CB No.	SIZE(mm)	T/G ELEV(m)	INVERT(m)
RYE1	375	97.45	NW=95.48
RYE2	375	97.20	NE=95.62
RYE3	375	97.70	NW=95.78
RYE4	375	97.30	SE=95.37
RYE5	375	97.35	NW=95.62
RYE6	375	97.05	NW=95.45
RYE12	375	97.25	N=95.55
RYT1	750	97.30	SW=95.36 SE=95.36
RYT2	375	97.25	SE=95.53 NW=95.53
RYT3	750	97.25	SE=95.31 NW=95.28 E=95.22 S=95.49
RYT4	375	97.15	NW=95.42 SE=95.42
RYT5	375	97.05	SW=95.14 SE=95.20
RYT9	375	97.55	SE=95.70 NW=95.70

NOTE:
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PRELIMINARY
NOT FOR
CONSTRUCTION

No.	REVISION	DATE	BY
2.	REVISED PER CITY COMMENTS	NOV 5/21	DDB
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JUN 2/21	DDB

SCALE
1:400
1:400
0 4 8 12 16

DESIGN DDB
CHECKED MSP
DRAWN MTM
CHECKED DDB
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
NOV. 5 2021
PROVINCE OF ONTARIO

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Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-GP2

D07-12-21-0080
#18539

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PLANA1.DWG - 841mm±594mm

M:\2021\121011\CAD\Design\121011-PR.dwg, PR, Nov 08, 2021 - 9:19am, mmckeough

NOTE:
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PRELIMINARY NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1.	ISSUED FOR CITY OF OTTAWA REVIEW	NOV 5/21	DDB

SCALE
1:500 HORIZONTAL
1:50 VERTICAL

DESIGN	DDB
CHECKED	MSP
DRAWN	MTM
CHECKED	DDB
APPROVED	MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
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Nov. 5 2021
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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

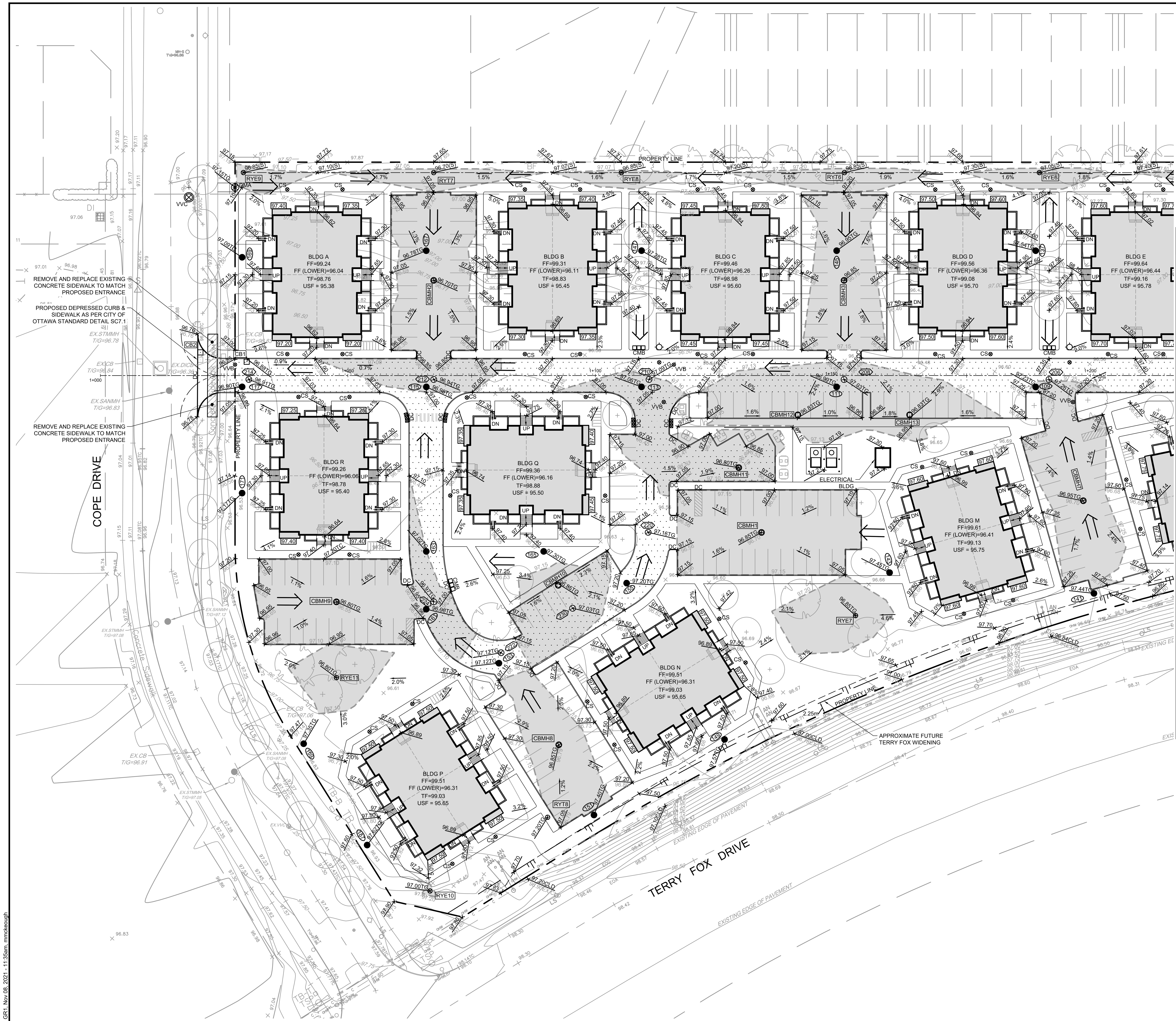
CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

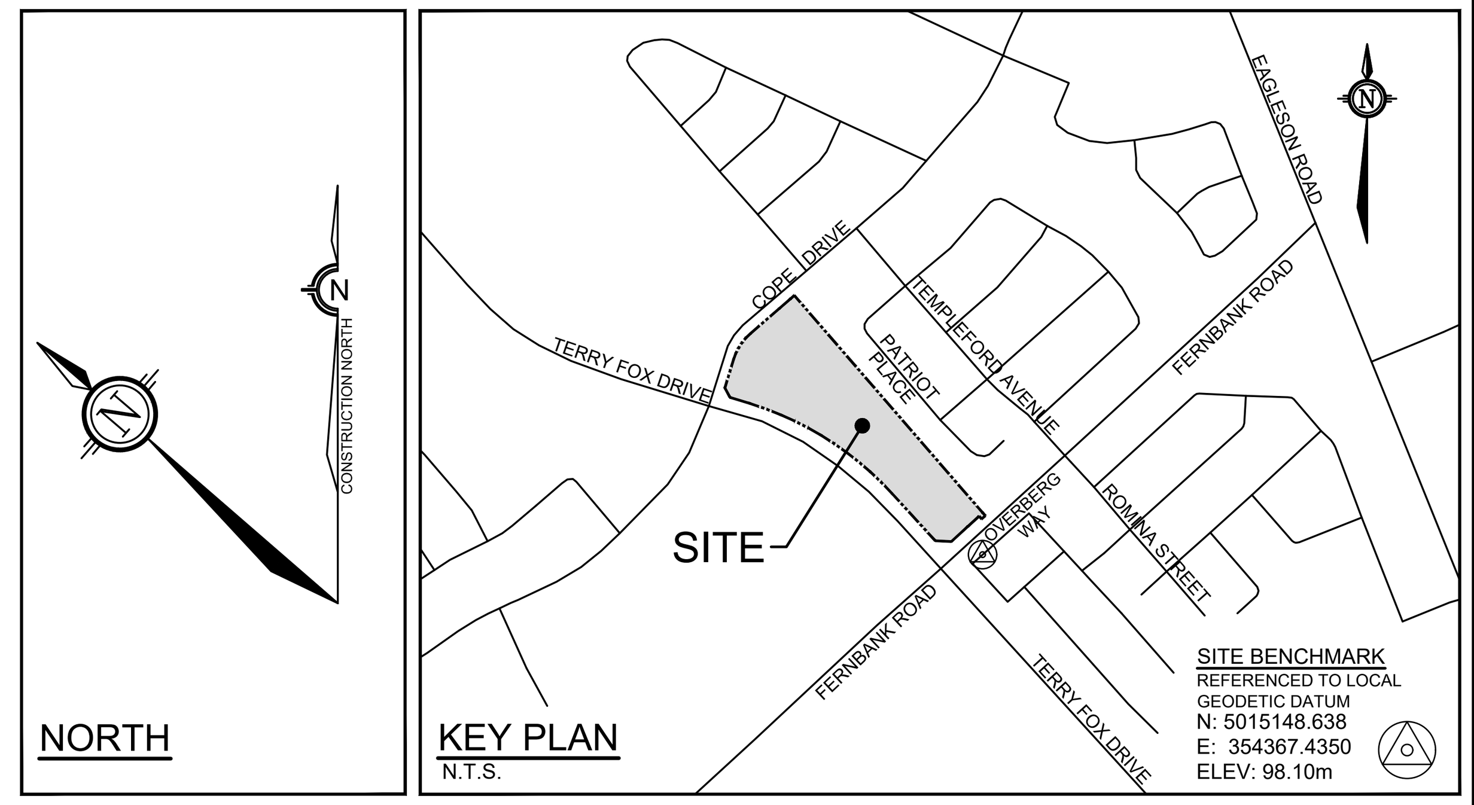
DRAWING NAME
PLAN AND PROFILE

PROJECT No. 121011-00
REV: REV # 1
DRAWING No. 121011-PR

PLANA1.DWG - 841mmx594mm

D07-12-21-0080
#18539





LEGEND

- 97.32 / 96.52 — PROPOSED ELEVATION / EXISTING ELEVATION
- 98.20TC — PROPOSED TOP OF CURB ELEVATION
- 96.85(S) — PROPOSED SWALE ELEVATION
- 96.80TG — PROPOSED TOP OF GRATE ELEVATION
- 97.20CLD — PROPOSED CENTERLINE OF DITCH ELEVATION
- PROPOSED RETAINING WALL
- FF= — FINISHED FLOOR ELEVATION
- T/F= — TOP OF FOUNDATION ELEVATION
- USF= — UNDERSIDE OF FOOTING ELEVATION
- MUSF= — MINIMUM UNDERSIDE OF FOOTING ELEVATION
- 97.70 — PROPOSED TERRACE ELEVATION
- MAXIMUM 3:1 SIDESLOPE
- PROPOSED CENTRELINE SWALE
- 2.0% — PROPOSED GRADE AND DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- HYD — PROPOSED HYDRANT LOCATION
- T/F=127.55 — PROPOSED TOP OF BOTTOM FLANGE
- V&VB — PROPOSED VALVE AND VALVE BOX
- CS — PROPOSED CURB STOP
- DMA — PROPOSED DISTRICT METERING CHAMBER
- 101 — PROPOSED SANITARY MANHOLE
- 100 — PROPOSED STORM MANHOLE
- CB 1 — PROPOSED ROAD CATCHBASIN
- CBMH 1 — PROPOSED CATCHBASIN MANHOLE
- RYE 1 — PROPOSED REAR YARD ELBOW
- RYT 1 — PROPOSED REAR YARD TEE
- Ⓜ — PROPOSED WATER METER LOCATION
- Ⓡ — PROPOSED REMOTE WATER METER LOCATION
- PROPOSED TWSI AS PER CITY OF OTTAWA DETAIL 7.2
- 97.55 — STATIC PONDING LIMITS AND ELEVATION
- 98.00 / 97.50 / 97.00 — *EXISTING CONTOUR LINE AND ELEVATION*
- *EXISTING FIRE HYDRANT*
- EX.SANMH — *EXISTING SANITARY MANHOLE*
- EX.STMMH — *EXISTING STORMMANHOLE*
- *EXISTING VALVE*
- HP — *EXISTING HYDRO POLE*
- EX.CB — *EXISTING CATCH BASIN*

PAVEMENT STRUCTURE DETAILS

*REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.

ACCESS LANES AND HEAVY DUTY TRUCK PARKING

- 40mm SUPERPAVE 12.5
- 50mm SUPERPAVE 19.0
- 150mm GRANULAR 'A'
- 400mm GRANULAR 'B' TYPE II
- SUBGRADE TO BE FILL, IN SITU SOIL, OR O.P.S.S. GRANULAR 'B' TYPE 1 OR 2 MATERIAL PLACED OVER IN SITU SOIL OR FILL

LIGHT DUTY PARKING

- 50mm HL3 OR SUPERPAVE 12.5
- 150mm GRANULAR 'A'
- 300mm GRANULAR 'B' TYPE II
- SUBGRADE TO BE FILL, IN SITU SOIL, OR O.P.S.S. GRANULAR 'B' TYPE 1 OR 2 MATERIAL PLACED OVER IN SITU SOIL OR FILL

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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PRELIMINARY NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
2.	REVISED PER CITY COMMENTS	NOV 5/21	DDB
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JUN 2/21	DDB

SCALE 1:400 (scale bar 1:400, 0 4 8 12 16)

DESIGN DDB · CHECKED MSP · DRAWN ATE · CHECKED DDB · APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER D. D. BLAIR 100122737 Nov. 5 2021 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

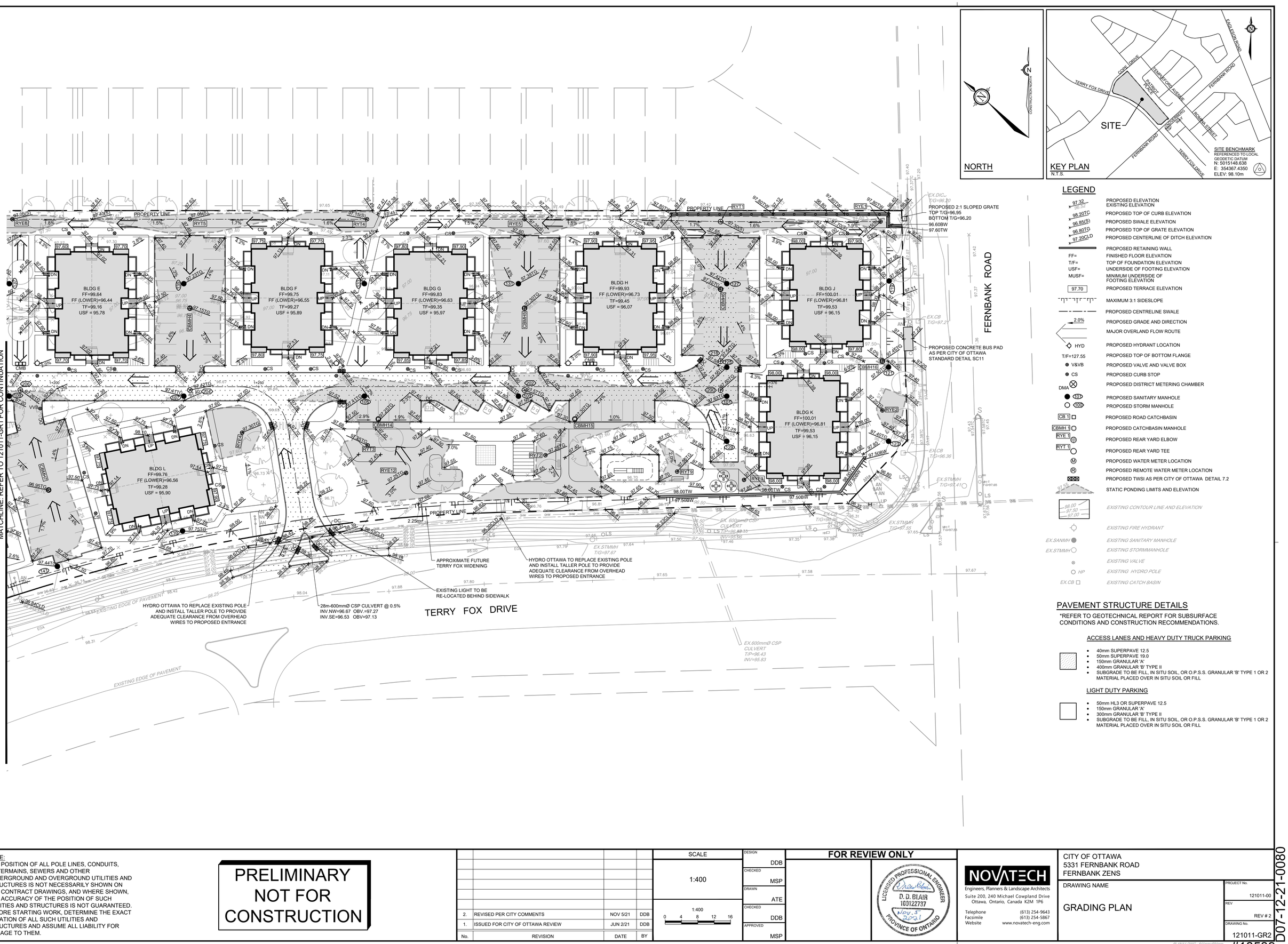
DRAWING NAME
GRADING PLAN

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-GR1

PLANA1.DWG - 841mmx594mm

D07-12-21-0080

#18539



LEGEND

- PROPOSED ELEVATION / EXISTING ELEVATION
- PROPOSED TOP OF CURB ELEVATION
- PROPOSED SWALE ELEVATION
- PROPOSED TOP OF GRATE ELEVATION
- PROPOSED CENTERLINE OF DITCH ELEVATION
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- FF= FINISHED FLOOR ELEVATION
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- M PROPOSED WATER METER LOCATION
- R PROPOSED REMOTE WATER METER LOCATION
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- EXISTING CONTOUR LINE AND ELEVATION
- EXISTING FIRE HYDRANT
- EX.SANMH EXISTING SANITARY MANHOLE
- EX.STMMH EXISTING STORMMANHOLE
- EXISTING VALVE
- HP EXISTING HYDRO POLE
- EX.CB EXISTING CATCH BASIN

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- 50mm HL3 OR SUPERPAVE 12.5
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SCALE
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1:400
0 4 8 12 16

DESIGN DDB
CHECKED MSP
DRAWN ATE
CHECKED DDB
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
NOV. 5 2021
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CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

DRAWING NAME
GRADING PLAN

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-GR2

D07-12-21-0080
#18539

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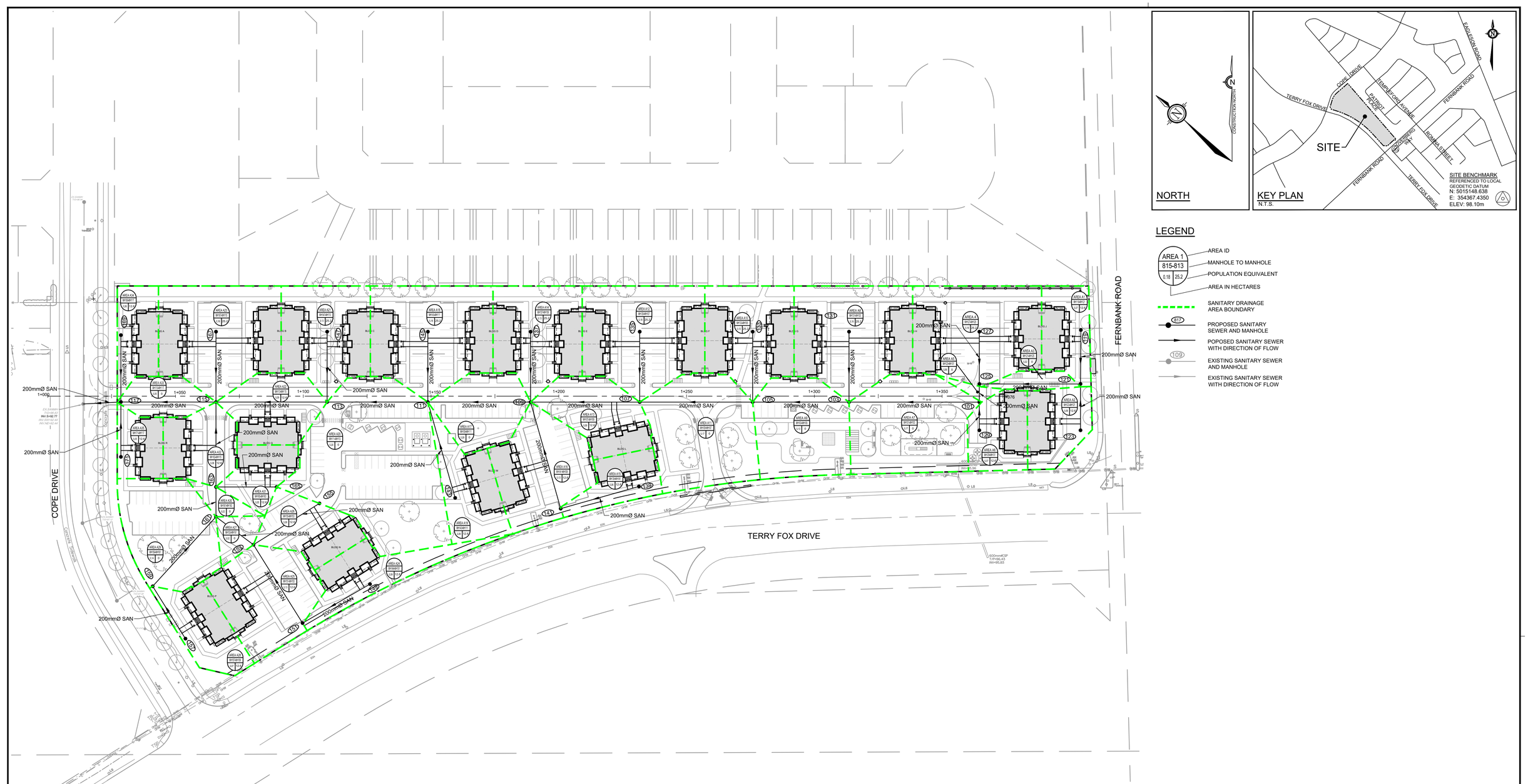

LEGEND

- AREA ID / MANHOLE TO MANHOLE / POPULATION EQUIVALENT / AREA IN HECTARES (AREA 1 | 815-813 | 0.18 | 25.2)
- SANITARY DRAINAGE AREA BOUNDARY
- PROPOSED SANITARY SEWER AND MANHOLE (817)
- POPOSED SANITARY SEWER WITH DIRECTION OF FLOW
- EXISTING SANITARY SEWER AND MANHOLE (109)
- EXISTING SANITARY SEWER WITH DIRECTION OF FLOW

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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2.	REVISED PER CITY COMMENTS	NOV 5/21	DDB
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JUN 2/21	DDB

SCALE: 1:750 (1:750, 0 10 20 30)

DESIGN: DDB
CHECKED: MSP
DRAWN: MTM
CHECKED: DDB
APPROVED: MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — D. D. BLAIR — 100122737 — NOV. 5 2021 — PROVINCE OF ONTARIO

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Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
5331 FERNBANK ROAD
FERNBANK ZENS

DRAWING NAME: SANITARY DRAINAGE AREA PLAN

PROJECT No. 121011-00
REV # 2
DRAWING No. 121011-SAN

D07-12-21-0080
#18539

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LEGEND

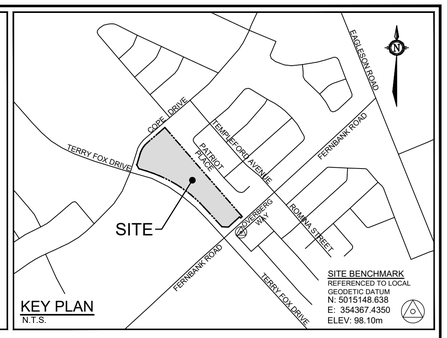
- PROPERTY LINE
- PROPOSED STORM MH & SEWER WITH DIRECTION OF FLOW
- CB 100 — PROPOSED ROAD CATCHBASIN
- CBMH 101 — PROPOSED CATCHBASIN MANHOLE
- RYE 1 — PROPOSED REAR YARD ELBOW
- RYT 1 — PROPOSED REAR YARD TEE
- DRAINAGE AREA BOUNDARY
- MAJOR OVERLAND FLOW ROUTE
- 1.00 / A1 / 105-103 / 0.50 — DRAINAGE AREA (hectares) / AREA IDENTIFICATION / MANHOLE TO MANHOLE / RUN-OFF COEFFICIENT
- 1:100yr PONDING AREA AND ELEVATION
- 1:5yr PONDING AREA AND ELEVATION
- PROPOSED TREES

NOTES:

*100 YEAR PONDING DEPTH IS GREATER THAN THE STATIC PONDING DEPTH DUE TO CASCADING WATER INTO THE NEXT AREA. THIS HAS BEEN ACCOUNTED FOR IN THE STORMWATER MANAGEMENT REPORT AND CONFORMS TO THE ALLOWABLE RELEASE RATE FROM THE SITE.

NORTH

CONSTRUCTION NORTH



KEY PLAN
N.T.S.

SITE BENCHMARK
REFERENCED TO LOCAL GEODETIC DATUM
N: 5015148.638
E: 354367.4350
ELEV: 98.10m

PONDING[1]

CB No.	RIM ELEV. (m)	EVENT	WATER LEVEL ELEV. (DEPTH) (m)
CBMH01	96.85	2yr	(0.00) 96.75
		5yr	(0.06) 96.91
		100yr	(0.19) 97.04
		Static	(0.30) 97.15
		100yr + 20%	(0.23) 97.08
CBMH02	96.70	2yr	(0.00) 96.29
		5yr	(0.09) 96.79
		100yr	(0.29) 96.99
		Static	(0.30) 97.00
		100yr + 20%	(0.36) 97.06
CBMH03	96.85	2yr	(0.00) 96.43
		5yr	(0.09) 96.94
		100yr	(0.31) 97.16
		Static	(0.30) 97.15
		100yr + 20%	(0.34) 97.19
CBMH04	97.15	2yr	(0.00) 97.03
		5yr	(0.12) 97.27
		100yr	(0.30) 97.45
		Static	(0.30) 97.45
		100yr + 20%	(0.31) 97.46
CBMH05	97.30	2yr	(0.00) 97.30
		5yr	(0.07) 97.37
		100yr	(0.17) 97.47
		Static	(0.30) 97.60
		100yr + 20%	(0.20) 97.50
CBMH06	97.35	2yr	(0.00) 96.31
		5yr	(0.00) 97.11
		100yr	(0.23) 97.58
		Static	(0.30) 97.65
		100yr + 20%	(0.29) 97.64
CBMH07	96.95	2yr	(0.00) 96.95
		5yr	(0.08) 97.03
		100yr	(0.24) 97.19
		Static	(0.30) 97.25
		100yr + 20%	(0.32) 97.27
CBMH08	96.85	2yr	(0.00) 96.78
		5yr	(0.15) 97.00
		100yr	(0.31) 97.16
		Static	(0.30) 97.15
		100yr + 20%	(0.32) 97.17
CBMH09	96.80	2yr	(0.00) 96.35
		5yr	(0.07) 96.87
		100yr	(0.23) 97.03
		Static	(0.30) 97.10
		100yr + 20%	(0.31) 97.11

[1]BASED ON PCSWMM MODEL
(4-HOUR CHICAGO STORM DISTRIBUTION)

PONDING[1]

CB No.	RIM ELEV. (m)	EVENT	WATER LEVEL ELEV. (DEPTH) (m)
CBMH10	96.85	2yr	(0.00) 96.21
		5yr	(0.08) 96.93
		100yr	(0.31) 97.16
		Static	(0.30) 97.15
		100yr + 20%	(0.32) 97.17
CBMH11	96.80	2yr	(0.00) 96.80
		5yr	(0.10) 96.90
		100yr	(0.23) 97.03
		Static	(0.30) 97.10
		100yr + 20%	(0.35) 97.15
CBMH12	96.83	2yr	(0.00) 96.67
		5yr	(0.07) 96.90
		100yr	(0.27) 97.10
		Static	(0.30) 97.13
		100yr + 20%	(0.35) 97.18
CBMH13	96.83	2yr	(0.00) 96.70
		5yr	(0.13) 96.96
		100yr	(0.27) 97.10
		Static	(0.30) 97.13
		100yr + 20%	(0.35) 97.18
CBMH14	97.25	2yr	(0.00) 97.20
		5yr	(0.14) 97.39
		100yr	(0.30) 97.55
		Static	(0.30) 97.55
		100yr + 20%	(0.32) 97.57
CBMH15	97.30	2yr	(0.00) 97.28
		5yr	(0.07) 97.37
		100yr	(0.18) 97.48
		Static	(0.30) 97.60
		100yr + 20%	(0.23) 97.53
CBMH16	97.45	2yr	(0.00) 95.78
		5yr	(0.00) 96.04
		100yr	(0.00) 97.20
		Static	(0.05) 97.50
		100yr + 20%	(0.00) 97.40
RYE01	97.45	2yr	(0.00) 96.31
		5yr	(0.00) 97.11
		100yr	(0.13) 97.58
		Static	(0.15) 97.60
		100yr + 20%	(0.19) 97.64
RYE02	97.20	2yr	(0.00) 95.78
		5yr	(0.00) 96.05
		100yr	(0.01) 97.21
		Static	(0.15) 97.35
		100yr + 20%	(0.21) 97.41
RYE03	97.70	2yr	(0.00) 97.20
		5yr	(0.00) 97.40
		100yr	(0.00) 97.53
		Static	(0.25) 97.95
		100yr + 20%	(0.00) 97.53
RYE04	97.30	2yr	(0.00) 97.20
		5yr	(0.09) 97.39
		100yr	(0.25) 97.55
		Static	(0.30) 97.60
		100yr + 20%	(0.30) 97.60
RYE05	97.35	2yr	(0.00) 97.03
		5yr	(0.00) 97.28
		100yr	(0.10) 97.45
		Static	(0.25) 97.60
		100yr + 20%	(0.14) 97.49
RYE06	97.05	2yr	(0.00) 96.44
		5yr	(0.00) 96.98
		100yr	(0.29) 97.34
		Static	(0.25) 97.30
		100yr + 20%	(0.36) 97.41
RYE07	96.85	2yr	(0.00) 96.75
		5yr	(0.07) 96.92
		100yr	(0.20) 97.05
		Static	(0.35) 97.20
		100yr + 20%	(0.25) 97.10
RYE08	96.85	2yr	(0.00) 96.30
		5yr	(0.07) 96.85
		100yr	(0.30) 97.15
		Static	(0.22) 97.07
		100yr + 20%	(0.34) 97.19

[1]BASED ON PCSWMM MODEL
(4-HOUR CHICAGO STORM DISTRIBUTION)

PONDING[1]

CB No.	RIM ELEV. (m)	EVENT	WATER LEVEL ELEV. (DEPTH) (m)
RYE09	96.85	2yr	(0.00) 96.29
		5yr	(0.00) 96.80
		100yr	(0.14) 96.99
		Static	(0.25) 97.10
		100yr + 20%	(0.23) 97.08
RYE10	97.00	2yr	(0.00) 96.78
		5yr	(0.00) 97.00
		100yr	(0.17) 97.17
		Static	(0.20) 97.20
		100yr + 20%	(0.21) 97.21
RYE11	96.80	2yr	(0.00) 96.35
		5yr	(0.07) 96.87
		100yr	(0.23) 97.03
		Static	(0.30) 97.10
		100yr + 20%	(0.31) 97.11
RYE12	97.25	2yr	(0.00) 97.20
		5yr	(0.14) 97.39
		100yr	(0.30) 97.55
		Static	(0.30) 97.55
		100yr + 20%	(0.33) 97.58
RYT01	97.30	2yr	(0.00) 96.31
		5yr	(0.00) 97.11
		100yr	(0.28) 97.58
		Static	(0.35) 97.65
		100yr + 20%	(0.34) 97.64
RYT02	97.25	2yr	(0.00) 97.20
		5yr	(0.14) 97.39
		100yr	(0.28) 97.53
		Static	(0.35) 97.60
		100yr + 20%	(0.28) 97.53
RYT03	97.25	2yr	(0.00) 97.20
		5yr	(0.14) 97.39
		100yr	(0.30) 97.55
		Static	(0.30) 97.55
		100yr + 20%	(0.33) 97.58
RYT04	97.15	2yr	(0.00) 97.03
		5yr	(0.13) 97.28
		100yr	(0.30) 97.45
		Static	(0.30) 97.45
		100yr + 20%	(0.33) 97.48
RYT05	97.05	2yr	(0.00) 97.03
		5yr	(0.23) 97.28
		100yr	(0.40) 97.45
		Static	(0.35) 97.40
		100yr + 20%	(0.43) 97.48
RYT06	96.85	2yr	(0.00) 96.43
		5yr	(0.09) 96.94
		100yr	(0.31) 97.16
		Static	(0.35) 97.20
		100yr + 20%	(0.33) 97.18
RYT07	96.70	2yr	(0.00) 96.29
		5yr	(0.09) 96.79
		100yr	(0.29) 96.99
		Static	(0.35) 97.05
		100yr + 20%	(0.37) 97.07
RYT08	97.20	2yr	(0.00) 96.78
		5yr	(0.00) 97.00
		100yr	(0.00) 97.16
		Static	(0.00) 97.20
		100yr + 20%	(0.00) 97.19
RYT09	97.55	2yr	(0.00) 97.20
		5yr	(0.00) 97.40
		100yr	(0.00) 97.53
		Static	(0.15) 97.70
		100yr + 20%	(0.00) 97.53

[1]BASED ON PCSWMM MODEL
(4-HOUR CHICAGO STORM DISTRIBUTION)

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DRAWING NAME
STORM DRAINAGE AREA PLAN

PROJECT No. 121011-00
REV REV # 2
DRAWING No. 121011-STM

D07-12-21-0080
#18539

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